

The Iron Age

A Review of the Hardware and Metal Trades.

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The Centennial Ground Plan.

We present our readers herewith a diagram showing, as accurately as is possible at this stage of the undertaking, the ground plan of the Centennial Exposition in Fairmount Park, Philadelphia. The cut gives a very correct idea of the location and relative size of the buildings to be erected, and the following table of reference will enable the reader to ascertain the names of the localities designated in the plan with alphabetical letters:

- A—The Machinery Hall.
- B—The Agricultural Hall.
- C—The Conservatory.
- E—Centennial Avenue.
- F—The Terrace.
- H—George's Hill.
- M—The Art Gallery.
- N—Covered way between the buildings.
- K—Belmont Reservoir.
- P—The Main Exposition Building.

The Grand Pavilion, or the Main Exposition Building, marked "P," will have a length of 2075 feet, and a width at the center and ends of 1000 feet. The length of the Agricultural Hall will be 1430 feet and of the Machinery Hall 2275 feet.

The area of ground in the park appropriated for the purposes of the Centennial Exposition includes 450 acres; the area covered by the grand pavilion is 36.5 acres, and the edifice is to be constructed with a capacity for expansion so that it may be made to extend over a space of 44 acres. The machinery hall will occupy 9.5 acres, and the agricultural hall, 4.5.

The arrangement of these buildings is peculiarly good. The machinery hall, it will be observed, is located directly upon Elm avenue, within a very short distance of the Pennsylvania Central Railroad tracks, so that there will be no difficulty in making a siding upon which heavy castings can be run directly into the hall; while wagons containing machinery can enter the department from the street without traversing the park roads. The grand pavilion has the same easy means of communication from the highway and the railroad.

It is understood that this ground plan is official, and that it presents the outline of the buildings and the surroundings as it will appear when the work is completed, with the single exception that space enough is to be left between Elm avenue and the buildings A and P for a piazza, or promenade. The general character and appearance of the buildings to be erected has already been described in these columns. Some slight modification of the details will probably be made, and when the architects shall receive final instructions we will give our readers the benefit of such additional information as may be of interest.

The Proposed Detroit Bridge.

The War Department having appointed a board of engineers to report upon the project of a railroad bridge over the Detroit River, at Detroit, protest has been made by vessel owners. The chief supporters of the project, of course, are the Michigan Central and other roads which have termini in or opposite to Detroit, to which an improvement in the means of crossing the river is almost a matter of life and death. Mr. James F. Joy, president of the Michigan Central, has written a letter to this Board of Engineers, which is a remarkably forcible presentation of the arguments in favor of the bridge.

Speaking first of the capital invested in the railroads which need the bridge compared with that in the lake marine which objects to it, Mr. Joy shows that the railroads represent a capital of about \$100,000,000, while that of all the shipping on the great lakes is not more than \$50,000,000. The disadvantage of the delays to the traffic over these railroads incident to an uncertain crossing like that between Detroit and Windsor is illustrated by the interruptions, lasting about four weeks, on the New York Central, in 1905, at Rochester, caused by floods in the Genesee River, which, Mr. Joy estimates,

occasioned damage, direct or indirect, equal to the entire cost of such a line as the New York Central then was. He thus concludes that the bridge is of great importance to the community which uses the railroads as well as to the railroads themselves. He then considers the effect upon navigation of a bridge with one draw having two openings 166 feet wide each. (The proposed bridge is to have two draws.) As vessels are always taken up by tugs, he concludes that in this direction the only objection to the bridge would be the necessity of waiting a few minutes until the draw should be open. There being openings on each side of the draw pier, there would be no occasion for tows to meet in the draw. In going down there need be no obstruction if the draw is open, but if not, the tow, if it could not be stopped in time, might be compelled to round to and start downward again, losing thus at the most not more than 30 minutes. This, he says, would be the

gan Central and Great Western railroads as much as \$1,000,000, aside from the losses imposed upon shippers.

There is hardly a doubt that the great system of railroads, whose traffic now crosses at Detroit, must and will get rid of the obstacle in some way. If a bridge is not permitted and the tunnel, as now appears, would be too long in construction, too uncertain of success, and too costly, then the difficulty must be flanked, and the traffic taken south of Lake Erie, which will be indirect, or north to Port Huron, where the channel is not liable to be closed by ice, which would be at once indirect and imperfect, a perfectly regular ferry being still much inferior to a bridge or tunnel for a very heavy traffic.—*Railroad Gazette.*

Pulverized Ore for Puddling Furnaces.

It is now about eight years since the "cold

The proprietors of the patent covering this method will allow a trial of it, requiring only that before making such trial they be consulted. They can show the highest testimonials from rolling mills in all sections of the country, by parties who have now been using it for years. Almost any of the Pennsylvania mills, east and west, the Ohio, Indiana, West Virginia and Missouri mills, can speak of its merits. Any information in regard to the subject can be had by addressing the proprietors, Mr. Hugh McDonald, of the firm of Phillips, Nimick & Co., Sligo Iron Works, Pittsburgh, Pa., or Mr. Richard Perry, at the Clinton Iron and Nail Works, Pittsburgh, Pa.—*Rolling Mill Information.*

Does Iron Improve with Working?

The question, "Does iron improve with working?" has had many theories in the affirm-

of improvement with it is also reached, when, by re-heating and re-rolling, it has ceased to work soft and readily in the rolls. This is a simple and practical answer to the question of how far iron is capable of being improved by working. In the rolling of odd shapes, if the iron be kept in the heating furnace a much longer time than is necessary to properly heat it, as sometimes happens through accident or delay, the iron in rolling will not so readily form itself into sharp corners and fine angles, is liable to crack if worked into beveled edges, and is afterward found to have suffered actual deterioration in quality of fiber.—*Rolling Mill Information.*

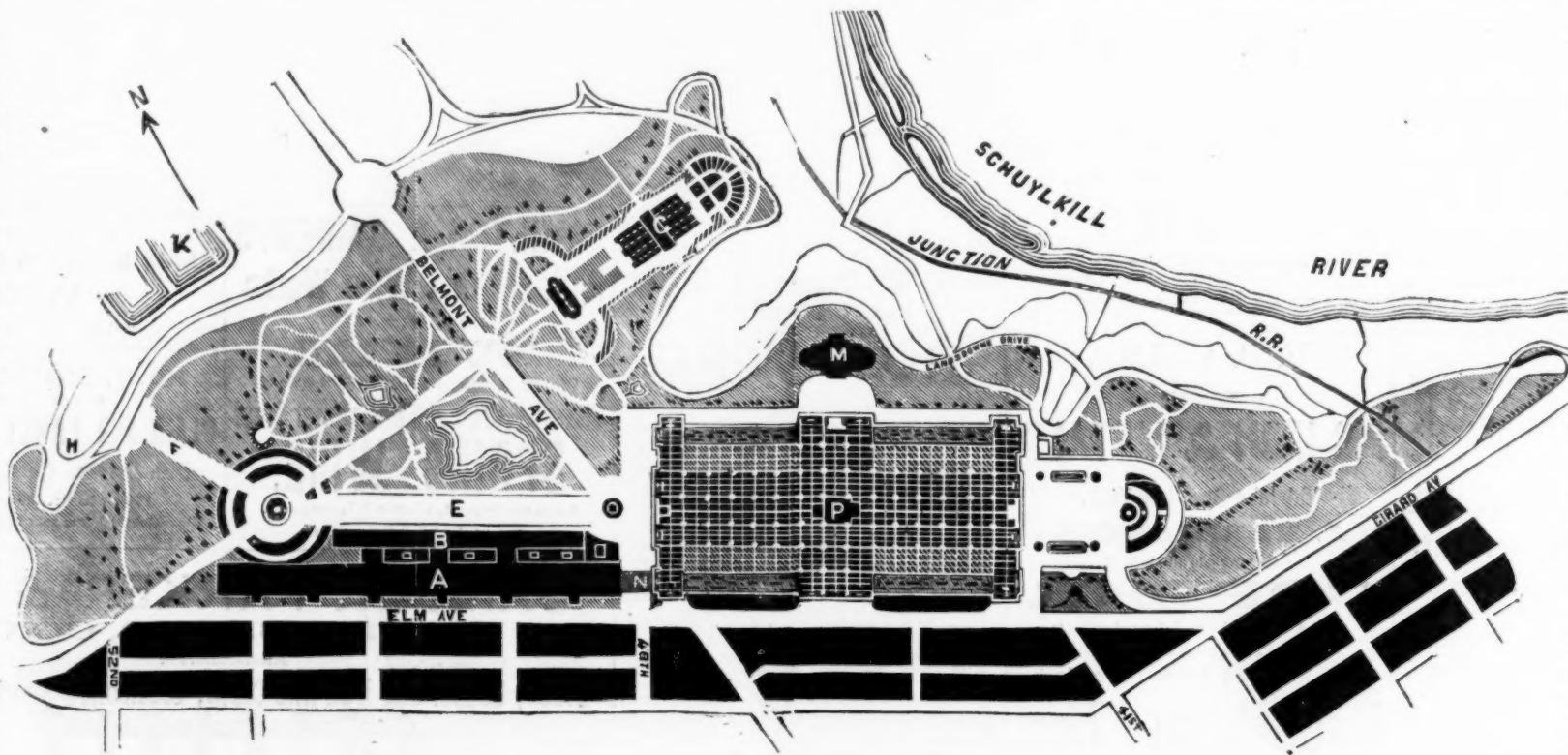
European Navies.—The Cologne Gazette

publishes a list of the iron clads of the maritime powers of Europe in 1873, which it claims to have obtained from official sources. England, according to this, has a war navy of 38 vessels, of 28,000 horse-power and 595 guns. Its home fleet consists of 14 large plated vessels, 4 plated batteries, and 5 plated gunboats, of more than 30,000 horse-power, and carrying 103 guns. The war navy of Russia counts 15 plated frigates and 4 cupola vessels, of 12,000 horse-power and 154 guns. The home squadron includes 10 turreted ships and 3 plated batteries, with 2710 horse-power and 94 guns. Germany has a war navy composed of 3 plated frigates of 2900 horse-power and 55 guns (not including 5 plated frigates and 1 plated corvette of 5100 horse-power and 48 guns), now in course of construction. The German Coastguard fleet consists of 2 turreted ships of 600 horse-power and 7 guns. The war navy of France is composed of 16 plated frigates and 19 plated corvettes, of 17,200

horse-power in all, and carrying 316 guns. The French home squadron contains 14 turreted vessels, 16 plated batteries and 6 rams, of 9320 horse-power, and carrying 268 guns. Austria has a war navy of 7 plated frigates and 4 case-mated ships, of 8150 horse-power, bearing 182 guns. There is no Austrian home squadron. The Italian war navy consists of 12 plated frigates, 2 plated corvettes and 1 ram, of 9100 horse-power, and having 168 guns. Turkey possesses a war navy of considerable strength, composed of 15 large plated war vessels, 2 of which have 9 inch plates, of 8530 horse-power in all, and carrying 116 guns of the heaviest calibre. Spain has 7 plated frigates, of 5000 horse-power and 145 guns, while in her coast fleet there are 3 turreted ships of 1800 horse-power, and carrying 9 guns. Finally, the Netherlands dispose of a Coastguard fleet of 22 vessels of various kinds, of 8800 horse-power, and bearing 114 guns.

New Compound for Furnace Bottoms.

Atwood's compound for lining the bottoms of Bessemer or Kelley converters, consists of carbon, preferably that obtained from old crucibles, although anthracite or bituminous coal may be used, German, or other plastic clay, old ground fire brick, Mount Savage stone clay, and burnt or unburnt sand. These materials are ground together and tamped into the mold, and the inventor claims, it will form a lining that will run from twelve to twenty-four heats (blows), whereas, with the compounds heretofore used, the lining will not last, on an average, for more than from three to five heats. It will be seen that the materials used are inexpensive, and such as are to be generally found about iron and steel works, in some form or other. A great saving is claimed to be made in time, and this claim is evidently a good one, provided the previous claim for durability for the lining is sustained. The time now lost in repairing converters having the old style of bottoms, is about one-third of the working time, so that where one hundred tons of steel are produced by using the old lining, converters lined by Atwood's compound will, at the same time, produce one hundred and fifty tons, provided it will last, as is claimed, for from twelve to twenty-four heats. If the advantages claimed for this invention are not exaggerated, it is a very important improvement.



THE GROUND PLAN OF THE CENTENNIAL BUILDINGS TO BE ERRECTED IN FAIRMOUNT PARK, PHILA. ELPHIA.

whole extent of the damage to navigation. The vessel owners say that on an average one vessel passes Detroit every six minutes during the season of navigation, but they usually pass in tows of from four to six, which would reduce the average number of passages to one in about half an hour. It is estimated that it would be necessary to close the draw about thirty times a day, and ten minutes each time, for the passage of trains, thus requiring five hours of each twenty-four, and this at fixed times of the day, which the tug officers would know beforehand, and Mr. Joy thinks that not more than one tow in fifty would be required to round to or slack up. The practicability of a draw in a crowded channel is illustrated by the experience of the Chicago and Alton and the Fort Wayne roads, the trains of both of which entering Chicago all pass over a single-track bridge over the Chicago river; and in 1868, when there was hardly half so many trains passing as now, this draw was opened 16,984 times within eight months, and let through 43,735 vessels, being one opening on the average in twenty minutes, and one vessel in seven or eight; and Mr. Joy might have added that there is comparatively little movement of vessels in the Chicago river at night, but perhaps quite as much by night as by day in the Detroit river.

Mr. Joy argues the case for the city of Detroit more forcibly, perhaps, than for the railroads; for the latter could be made, at considerable disadvantage, and to the ruin of the Canadian lines, to find an outlet south of Lake Erie, which would make Detroit a dwelling place of bats and owls. But without any diversion by the railroads now entering Detroit from the west, Mr. Joy shows that the Flint and Pere Marquette, with its line from Saginaw to Toledo, the Lake Shore with its branches to Jackson, to Lansing and to Grand Rapids, and the Pennsylvania, with its completed line from Fort Wayne through Kalamazoo and Grand Rapids to the upper end of the lower Peninsula and its line begun from Mansfield northeast through Coldwater to Lake Michigan, will be ready and (in case the Detroit roads are unable to supply a trustworthy outlet across the river and eastward) able to divert the main part of the traffic of the State at once from the Detroit railroads and Detroit itself. The delays of last winter, Mr. Joy estimates to have cost the Michi-

fix" was brought to the attention of rolling mill proprietors, during which time it has grown to be a matter of necessity as lining for puddling furnaces. It is now in use in nearly, or altogether, one hundred rolling mills throughout the country, and is still being adopted. Its merits are now well known and no longer disputed, having long since past the experimental period, and taken its place as one of the recognized improvements in iron making. Notwithstanding anything to the contrary, it not only does save the furnace, as by actual experiments, and not confined to merely a few mills, it has been shown that six, seven and eight weeks are added to the duration of furnaces using it. In the early use of pulverized ore as fettling, it was thought to give a red short tendency to the iron, but this has long since been settled in the negative. Here in Pittsburgh, where it is in use at all of our rolling mills, it has reduced the amount of coal necessary to 34 bushels to the ton of iron produced (2340 lbs.). This is the amount of fuel during the whole time that the furnace is with fire. A very great difference in the quantity of ore necessary is found between giving the puddlers a certain allowance and permitting them to take as much as they will. Should the furnace need any slight repairing during the day's work, no trouble or delay is experienced, because, by this method of using the ore sufficient can be put in to cover any spot needing it. The amount of scrap necessary is very much reduced; the necessity for keeping the furnace in a high heat long after the last ball has been drawn; and thus the wear and tear of the furnace is very greatly reduced, as before mentioned. The difference in the labor saved by the use of the "cold fix" makes it a matter of great importance, particularly during the summer months, as a better class of men can be had when using it, than when the ore is melted and used in the old way. It has in many mills taken the place of soapstone, as material for repairing the furnace; for while soapstone does, under some circumstances, work into and injure the iron, the ore imparts nothing but what is beneficial. While there is a difference found in the quality of ore used, none that is fit for manufacture at all has been found unsuitable when pulverized, and by the use of water made into a kind of batter, as clay, according to this method.

ative, with little or nothing against it. We think it can be shown that iron can be overworked while in process of manufacture, or at least, between much heating and much working it can be overdone, especially by the former. The reheating of iron lessens the amount of cinder contained in it. Simply and plainly, this is best proven by the use of old furnace tools, old grate bars, and much other old scrap iron that has been subjected to alternate heating and cooling, which, when fagoted and rolled, produces an iron of inferior quality. Next, it can be shown by the rolling of piles, or blooms, that have been kept in the furnace an undue length of time, till the cinder having been consumed—"dried up," as the expression is—will be shown in the rolling to have become stiff, unpliant, and liable to crack, if the shape that it is worked into is very thin, or of irregular form, such as angle iron, T iron, &c. Iron is overworked when it ceases to work soft and easy from the liquid cinder that it should contain. Some iron possesses more cinder than others, and that iron which has much cinder can be worked with advantage to its quality, as long as the cinder holds out; to this extent it can be improved by working, but to the point at which a lack of cinder makes it work stiffly and dryly, it will no longer improve by working.

The extent to which iron should be worked should have reference to its after uses. If the iron be worked till all the cinder is excluded, and just then is at its maximum of quality, then it would be unfit for any further manipulation in the hands of the user who might require to further heat and work it to his purpose; for its maximum having been attained by heating and working until the cinder is out, it but deteriorates by any further heating and working. The more work that it takes to exclude the cinder, the more will it improve by this work, but it has reached its highest capability of improvement when this is attained. Some iron, then, is at its best by one heating and rolling, while other iron is the better of a second heating and rolling. Some will improve to the third heating and rolling, but of common iron not much of it is of this character. This is in regard to puddled iron, but the same principle applies or governs the question as to charcoal iron. The latter, being more homogeneous, will endure more work; but the highest point

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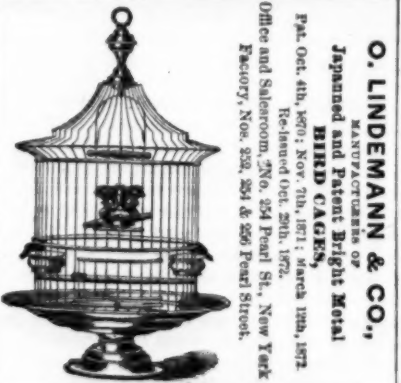
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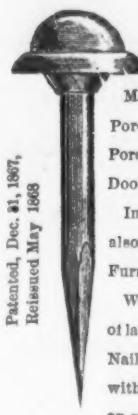
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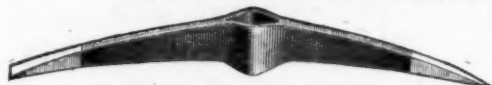
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October 18, 1873.

Armor Plates.

Armor plates were first used in the construction of ships of war in the case of an iron steam battery for harbor defense, commenced at Hoboken, U. S., in 1844. At the suggestion of the Emperor Napoleon some floating batteries, clad with 4 in. armor, were built during the Crimean war, and employed in some of the operations in the Black Sea, but these as well as some built by our own Admiralty in imitation of them, were of very little use, on account of their clumsy form, and it was not till the advent of the French La Gloire and our own Warrior that it began to be seen that the war ships of the future would be iron-clads. In 1861, when the Warrior was built, it was believed that, while the thickness of her armor (4½ in.) represented the maximum of weight which a seaworthy steamship could carry on her sides, it, at the same time, provided a defense practically invulnerable. Both these views were soon shown to be defective, and it is now seen to be practicable to build, as well as desirable to have, seagoing masted ships with armor averaging 7 in. in thickness, and in some large ocean cruisers, without masts, 10 to 12 in. of armor have been used on their sides, and 12 to 14 upon their turrets. Nor does this great increase in the thickness of armor constitute the sole advantage which recently constructed iron-clads have over the Warrior. Beside the important consideration that the armor is so distributed over the surface of some of our latest iron-clads that a belt at the water line throughout the ship, and other really important parts, are protected, which is not the case with the Warrior, where merely the middle portion of the ship is iron-clad, it must be added that armor plates are now better made and are fastened on the ship's side much more securely than formerly. Experiments made at Shoeburyness, under the direction of a committee appointed for the purpose, have furnished data upon which have, from time to time, been determined the thickness and nature of the backing behind the armor, and the character of the fastenings by which the armor is secured to the ship.

The extent of surface to be clad with iron in any ship and the thickness of her armor are determined by her designer, and in reference to her other qualifications. A model is made at the dock yard, and on it the size and dimensions of the separate plates are planned, and an account of these particulars, and also of the form of each plate, is sent to the manufacturer. Armor plates are usually from 15 to 18 ft. long, and from 3 to 4 ft. wide. Two methods of manufacturing them—namely, hammering and rolling—have been tried, and each has had its advocates, but the government of this country has decided in favor of the latter, and for the last seven or eight years all armor plates used for the ships of the Royal Navy have been rolled plates. The firms who manufacture most of the armor used in the construction of the English iron clads are Sir John Brown & Co., of the Atlas Works, Sheffield, and Messrs. Cammell & Co., of the Cyclops Works, Sheffield. The Thames Iron Company, who were the builders of the Warrior, still adhere to hammered in preference to rolled plates, and many ships built for foreign governments have this description of armor. The process of rolling plates is thus described by Sir John Brown: "Bars 12 in. broad and 1 in. thick are first rolled, five of these are then piled on and rolled into a rough slab, two of these slabs are now rolled into a plate 2½ in. thick, and, finally, four of these 2½ in. plates are piled and then rolled into the finished 4½ in. plate." It will thus be seen that pieces of iron of an aggregate thickness of 20 in. are, in the process of manufacture, rolled into one plate 4½ in. thick. The rolling is performed by means of two heavy cylindrical rollers, one placed vertically over the other, the lower one suspended at a fixed height, the upper one movable up or down, so that the width of the opening between them may be varied at pleasure. The rollers turn in opposite directions, each toward the opening between them on the side next the furnace in which the iron is heated, so that a mass of iron passed in between them is forced through by their rotation. They are turned by steam-power. The rollers being set at a distance from each other a little less than the thickness of the iron in the furnace, the heated metal is brought out and placed between them, and is at once rolled through, coming out on the other side reduced in thickness, but of increased length and breadth. The distance between the rollers is then decreased, and the iron passed through again, and so on, until it is of the required thickness. By the immense pressure thus brought to bear upon heated metals, the various pieces of which it is composed are thoroughly welded into one mass. In the manufacture of hammered plates the welding is effected by blows from a steam hammer, instead of by rolling.

Before the plates are sent to the dockyard, one or more are chosen at random by a government official to be tested. The testing is performed at Portsmouth, on board the Thunderer, an old wooden ship. The plates are fastened to a target erected at one end of the ship, and shots are fired at them from guns of prescribed calibre, in a battery at the other end, the men being protected from the splinters of the shot by a casement. If the plate does not stand the test satisfactorily, the lot from which it was selected is rejected. This system of tests secures as good an article as it is possible to make. During the first few years of the manufacture it was found that the plates were often split and cracked by the shot, in the neighborhood of the holes which had to be bored through them for the screws or bolts by which they were attached to the targets. It was thus assumed that these holes were necessarily a source of great weakness, and many schemes were proposed for connecting plates with the

ship's side in ways by which this important defect might be avoided. One was, that an iron frame should be attached to the ship and the plate dropped into it, the edges of the frame being afterward beaten over to secure the plate in its place. The necessity for anything of this kind has been obviated by the great improvements which have been effected in the quality of the armor; the metal now used is so tenacious that it is scarcely any weaker in the neighborhood of a bolt hole than in any other place. The superiority of the armor of the present day over that made ten years ago was fully exemplified in the recent experiments on the turret of the Glatton. A hole was punched through one of her 14 inch plates by the shot, but there was no other damage done to the plate than the mere penetration. Under similar circumstances, in the case of plates experimented upon at Shoeburyness, some years ago, there would be seen large cracks radiating from the shot hole, producing a complete separation of the plate as far as the nearest bolt holes, and in many cases the armor plate would have been broken in two or three pieces. The price of armor plates, some little time ago, was about £30 per ton; their value now is of course subject to the same fluctuation as that of other iron.

Armor plates are usually bent to the shape required by hydraulic pressure. A block of cast iron having its upper surface hollow (of the same shape as the armor plate is to be), is placed upon the piston rod of the hydraulic press. Upon this is laid the armor plate, and above it is constructed a framework of iron bars, firmly fixed, so that their under sides form a surface of a corresponding shape to the block below. When the plate is in its position upon the cast iron block, the pressure is applied, the effect being that the plate is lifted slowly, and brought in contact with the framework above, and so gradually squeezed into the shape required. Before being bent, the plates are carefully and gradually heated in a furnace, the required temperature being indicated by a bright red color in the iron; if it were made hotter it would be liable to be indented, or spread out laterally, in the process of bending; if not so hot, there would be a danger of the plate cracking when subject to great pressure.

An important element in the armoring of ships, is the cushion of wood which is placed between the armor and the main structure of the ship. The part of the ship to which the armor is attached is built up of iron ribs and plating, and is so constructed as to be complete, both as regards strength and water-tightness, before either the armor or wood backing is put on. The armor is rather a source of weakness to the structure than otherwise, and if its edges were not accurately fitted, so as to prevent any possibility of the plates moving, its working would, in a heavy sea, seriously endanger the ship. In the Warrior, the wood behind the armor is 1½ ft. thick; in ships of more recent construction, it is generally from 10 to 12 in.; but, in some cases, there are two layers of backing with an intermediate iron skin. During the building of the earlier iron-clads, there was much discussion about the relative efficiency of different kinds of backing. Some very eminent engineers and naval architects believed that a ship's side entirely made of iron would offer more resistance to shot than would armor and wood backing of the same weight per square foot of surface—in other words, that a 6 in. armor plate was more effective than a 5 in. plate with a 9 in. thickness of teak backing behind it. It was proved by experiment that such was not the case, and that the latter was much superior to the former arrangement; it is possible, however, that the improved quality of the iron, taken in conjunction with the perishable nature of the wood, may ultimately lead to a reconsideration of the whole question, and perhaps to the abandonment of backing behind armor. Among the various kinds of backing which have been proposed are india-rubber, compressed cotton wool, mill-board, and even water in tanks; not one of them, however, has proved to be as good as wood. Teak is the kind of wood generally used, both from its durability and its freedom from acids, which would corrode the iron. The logs of teak are usually placed on the ship's side in the direction of her length. If there are two layers, the logs of the outer one are arranged vertically so as to cross the others. The backing is fastened to the iron skin of the ship, and all the seams in it are well caulked to add to its rigidity as well as to render it water-tight. Previous to an armor plate being placed on the ship, a coating of a glue, manufactured for this purpose, is spread (hot) upon the wood, the surface of the plate also being slightly heated, and thus all inequalities in the attached surfaces are filled up.

The means of connecting the armor to the ship has, like almost every other detail in the construction of ironclads, been a fruitful subject of debate. The French use large screws, which pass loosely through holes in the armor and into the wood backing, and by the hold of the screw in the wood, keep the armor in its place. A great disadvantage attending this is, that in the event of the armor being bent by shot, it is all but impossible to get the screws out. In the English ironclads, bolts pass through the armor, wood backing, and iron skin of the ship, having a screw upon their inner end, upon which a nut is screwed up after the bolt is in its place. The bolt is driven through the wood, and has thus its tightness in the wood as well as the screw-nut on its end to keep it fast. In the French system it is found that the effect of the firing of shot is to drag the screw out of its hole in the wood, thus allowing the armor plate to curl outward, while, on the other hand, in the case of the nut and screw bolt, the bolt breaks off at its weakest point—4, e., the beginning of the screw. To

prevent this an india rubber ring is placed upon the bolt, enclosed in an iron cup ring, and having another iron ring between the india-rubber and the screw nut. The elastic ring admits of the bolt being drawn out slightly in response to the blow of a shot, and thus tends to break the shock which would otherwise cut the bolt. The danger to the fastenings of the armor is produced, as has been indicated, by the tendency which plates have to bend when struck by a shot. The plate can only be slightly forced in at the place where it is struck, because of the support behind; the consequence is, a tendency to spring out on all sides of the shot mark.

The armor plates used by the Americans in the construction of their monitors were not welded together, as are those used by our own government; they were made by simply connecting thin plates together by means of rivets; thus, a 10 in. plate would be made by riveting together ten 1 in. plates. By experiment it has been ascertained that a good 5 in. rolled plate is much more capable of resisting shot than 10 in. armor built up in this fashion. In conclusion, it may be remarked that it is not enough, in comparing two iron clads of similar design, to say that they have each armor of a certain thickness; the quality of the armor plates, the accuracy with which they were fitted on the ship, and the nature of the fastenings by which they are kept in place, may so affect the question as to give one ship a decided superiority over another which is said to be as strong.—Nautical Magazine.

Affairs at Catsauqua.—We learn from the Catsauqua Dispatch that the mills of the Catsauqua Manufacturing Company, which closed some three weeks ago for want of orders, now bid fair to remain so during the winter, in consequence of the employees refusing to accept the wages offered. "We have seen," says the Dispatch, "a copy of the circular addressed to the men by the company on Saturday of last week. In this circular the company assert that while, during the past few years, their rates have been governed by the wages paid by the Philadelphia city mills, yet the great bulk of their iron has been sold in direct competition with mills located at Phoenixville, Pottstown, Reading, Scranton, Elmira and Troy, in all of which mills labor has always been paid from 10 to 30 per cent. less than here, and that in consequence of this they have been obliged for some time past to sell their iron at very near cost in order to retain their trade. To remedy this and enable them to meet competition, they offer a reduction of 9 per cent. on puddling, 15 per cent. on day labor, and from 15 to 20 per cent. on mill labor, and at the same time propose to reduce rents of all houses owned or controlled by them 20 per cent. At this reduction, we are informed, puddlers, at the new price of \$5.25 per ton, can still average \$4.50 per day; helpers, \$2.10 per day; heaters, \$5 to \$6 per day, and other skilled workmen in proportion. After two meetings held to consider the matter, the puddlers returned an answer declining the wages offered. What conclusion the mill men reached we have not heard. The company being now relieved from all responsibility as to the suffering that must undoubtedly follow from this action of their men, proposed to keep their mills closed until such time as they can start on their own scale of wages without reference to Philadelphia mills. We presume that, on the lowest estimate, there must be 1500 persons in our borough and Fern Dale who are directly affected by this stoppage. Some families, we are told, are already suffering, and we hope that something will happen to break this deadlock before many days."

The Hallside Steel Works.—A very powerful company has been formed in Glasgow, under the designation of the Steel Company of Scotland, for prosecuting the manufacture of steel in accordance with the patent processes of Mr. Siemens. A suitable site being obtained a few miles to the east of the city, near Cambuslang, and closely adjoining the Caledonian Railway, the erection of the works was duly commenced. Owing to the enormous extent of the works embraced in the scheme, and the difficulty of getting the necessary labor, the progress made was but slow. At length, however, work has been fairly begun. For the present, rails alone are to be made, and of these it is confidently anticipated that at least 3000 tons will be manufactured before the end of the year. The appliances that have been erected in the shape of Siemens gas producers, furnaces, steam hammers, rail-rolling mills, &c., are quite sufficient to justify the management in their anticipations. All the arrangements are in accordance with the most approved notions as to the practice of economy in labor, fuel, &c., and the plans embrace the ultimate extension of the works to three times their present size, even though the portion already erected is on a very grand scale. In course of time it is intended to enter upon the manufacture of general steel forgings, castings, tires, axles, &c.

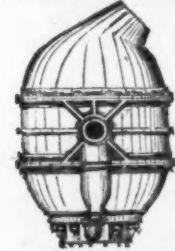
A Sub-Marine Mountain.—During the recent soundings in the Pacific Ocean, by the party engaged in selecting a route for the projected Pacific cable, a sub-marine mountain of considerable magnitude was discovered in latitude 40° 30' N. longitude 127° 11' W., and about 150 miles from shore. It had over its summit 996 fathoms of water. A line of soundings was run around it of about 20 miles diameter, at no point of which less than 1670 fathoms of water was obtained, making this mountain about 4000 feet in height. Its summit was evidently of rock, as was proved by the sounding machine falling to bring to the surface any ooze; and in one cast, by a fresh indentation being made in the machine, which could only be occasioned by its coming in contact with some hard material.

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New Patents.

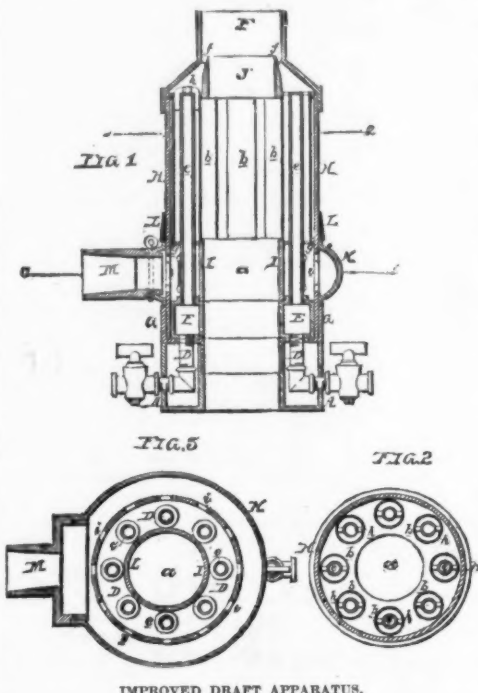
We take from the records of the patent office at Washington the following specifications of certain patents lately issued, which will be found interesting:

IMPROVEMENT IN DRAFT APPARATUS FOR METALLURGIC AND OTHER FURNACES.

Specification forming part of Letters Patent No. 144,585, dated November 11, 1873, issued to George Wingate, of Boston, Mass.

This invention relates to apparatus for exhausting the air above a fire place so as to create a draft therein, and consists of pipes and passages arranged as described hereafter, and heated so as to create or facilitate a flow of air or gas, and thus produce an upward blast in the stack. In the drawing, Figure 1 represents part of a stack of a furnace, with the draft apparatus applied thereto; Fig. 2, a sectional plan on the line 1 2; and Fig. 3, a sectional plan on the line 3 4, Fig. 1.

The hollow casting A, through which the steam pipes B B pass, may represent the foundation of the chimney or stack, and directly above the same is an annular steam chamber, E, of a square sectional form in the present instance, the said steam pipes communicating with the bottom of this chamber at opposite points, and being provided with suitable cocks. The steam chamber rests upon and is contained within a short cylindrical



IMPROVED DRAFT APPARATUS.

casing, G, between which and the said chamber intervenes the outer cylindrical casing H of the stack, which is surmounted by the cap-piece F. An air chamber, D, is formed between the casing H, the top of the steam chamber, and a short cylindrical casing I, the latter having a flange g, upon which rest a series of pipes b, communicating with the air chamber, and supporting at their upper ends a plate and nozzle, J, between which and the cap F intervenes a narrow annular aperture, f. The air pipes b are arranged so that the products of combustion, passing upward, shall be in direct contact with said pipes; and through the interior of the said pipes, as well as through the air chamber D, extend a series of steam tubes, e, communicating freely with the steam chamber E at their lower ends, but closed at their upper ends, where they are steadied and prevented from vibrating by stays h. (See Fig. 1, and inverted transverse section, Fig. 2, on the line 1 2). In the casing H, at the point where it forms the outer wall of the air chamber D, are a series of openings, i (see transverse section, Fig. 3, on the line 3 4, Fig. 1), which are covered by an exterior annular casing, K, confined between the upper edge of the casing G and a band, L, fitting around the casing H, the said exterior casing having an inlet, M, and being capable of rotating upon the casing H, so as to present the funnel-like inlet M to the wind, that the latter may blow directly therein and pass into the chamber D. Air, preferably under a slight pressure, is caused to enter the casing K, and, after circulating in the same, passes equally through all of the openings i into the chamber D, whence it rises through the pipes b, it being heated by the steam and gases both in the said chamber and pipes, and consequently expanded, so that it escapes finally through the annular passage f, between the cap F and nozzle J, under a very considerable degree of pressure, and thus produces a partial vacuum in the stack, which induces the required rapid upward movement of the smoke and gases through the central passage a, and thus serves as effectually as the usual blast in promoting combustion, but without involving the usual expenditure of fuel.

If it be desired to introduce the air into the apparatus under a strong pressure, a blower may be attached to the inlet pipe. Steam alone, or the gases alone, or both together, as above described, might, in carrying out this invention, be used for expanding and increasing the velocity of the air.

Claim—1. The combination, with a flue, or stack, of a series of air tubes, or passages, communicating with the flue, and arranged substantially as described, so that the air therein is heated and passes as a blast into the stack.

2. A draft producing apparatus in which air pipes, b, contained within the space through which heated products of combustion are caused to pass, are combined with steam heating tubes, e, extending longitudinally through the said air pipes.

3. The combination, substantially as described, of the steam chamber E, its tubes e, the air chamber D, pipes b, casings H and G, cap F, nozzle J, and the annular passage f, intervening between the said cap and nozzle.

4. The combination, substantially as described, of the air chamber D and its openings i, with the exterior annular casing K, whether the latter be fixed or movable.

IMPROVEMENT IN THE MANUFACTURE OF IRON AND STEEL FROM GRANULATED IRON.

Specification forming part of Letters Patent No. 144,009, dated October 28, 1873, issued to Charles Wood, of Tees Iron Works, Middlesborough-on-Tees, England.

The invention has for its object improvements in the manufacture of wrought iron and steel. Rotating puddling furnaces are now well known, and are in common use. These furnaces have been worked in two ways. Sometimes the iron to be puddled is put into the furnace in the form of pigs, and at other times the metal is melted in a separate furnace, and then run into the rotating puddling furnace.

There are disadvantages attendant on both these methods of working. When pig iron is charged into the rotary furnace damage is almost necessarily done to the linings of the furnace, and much time and fuel are wasted in melting. On the other hand, if melted iron be run into the furnace it is found that the yield of metal is decreased, less metal being reduced out of the fettling, and the quality of the produce is not so good as when the metal is puddled from the cold pig.

These disadvantages are avoided in this invention by charging the rotary furnace with the metal in the state of granules. When this is done the furnaces can be rotated immediately after receiving the charge, by which means the temperature is kept uniform all round the furnace, and every portion of the metal is, in succession, brought into contact with the lining by the rolling of the heap of granules over and over within the furnace, an operation which facilitates the taking up of the metal from the lining, and at the same time causes the granules very rapidly to take up the heat of the furnace, while, at the same time, also, every particle of metal is in turn exposed to the action of the flame.

It is not necessary that the metal should be finely granulated; it works well in granules of the sizes of marbles.

Any efficient rotary puddling furnace, such as Danks' or Cramp-ton's, may be employed. The puddling operation is, in other respects, conducted in the ordinary manner, so as to produce wrought iron or the steel description of iron known as puddled steel.

Shot iron has been puddled in an ordinary puddling furnace with a stationary hearth; but in such case the granules at the bottom are exposed to flame by stirring the mass, or by raising the bottom granules through the others; whereas, when granulated iron is treated in a rotary furnace, all the granules of the charge are caused to rotate consecutively, so as to change their relative positions by a rolling movement, and to be exposed alternately and successively to the action of the flame and the oxidizing action of the lining of the furnace.

Claim—The improvement in the art of puddling granulated iron, consisting in causing the granules to rotate consecutively while exposed to flame, substantially as before set forth.

IMPROVEMENT IN THE MANUFACTURE OF CAST IRON FOR CAR WHEELS, &c.

Specification forming part of Letters Patent No. 143,874, dated October 21, 1873, issued to Charles Burgess, of Portsmouth, Ohio.

This invention relates primarily to the production and use of a superior and cheap article of iron for chilling purposes. The inventor thus describes the process:

One mode of carrying out my invention may be described as follows: I put through my refining process, as described in my patent of August, 1873, hot blast iron (stone coal pig or hot blast charcoal pig), and produce an article of hard white iron far superior for the purpose named, and of less than two-thirds the cost of cold blast white iron, which is now used for this purpose as a component in metal for car wheels and for other purposes. With the refined iron thus produced, I combine the ordinary cold blast charcoal (soft gray) pig iron, or hot blast (soft gray) pig iron, or both, in suitable proportions, according to the quality of the metal and the depth of chill required or desired. The soft gray iron is employed for its toughness, and gives the required strength. The refined iron imparts the chilling properties to the composite metal. The refined iron is equally adapted for malleable iron castings, in place of a high priced cold blast iron, and for casting into pipes and agricultural implements, where a hard, good wearing iron is required. It is also highly adapted to be manufactured into bells, owing to its clearness; also, for the manufacture of chilled rolls. In combining the refined metal with soft gray iron, no specific proportions can be observed, owing to the variation in the quality and properties of such iron; but, in determining the proper proportions in individual cases, the ordinary skill of foundrymen is all that is required.

I do not claim to make by my process part-steel castings. My refined cast iron is not steel, or wrought iron, or semi-steel, but a "fined" or partially refined cast iron that can be charged with the pig in a cupola or air or gas furnace of any kind, such as is ordinarily used for melting iron for castings. The fined cast iron will fuse regularly with the pig iron, or

the fined cast iron may be melted separately and at the same temperature that will melt ordinary pig iron. With my refined iron I combine the usual strong soft gray iron in suitable proportions, as explained.

I have found the following mixture to produce satisfactory results: Hot blast strong cast iron, two-tenths; cold blast strong cast iron, three-tenths; refined cast iron, five-tenths. Hot blast strong iron, three-tenths; cold blast strong iron, three-tenths; refined cast iron, four-tenths. Hot blast strong iron, three-tenths; cold blast strong iron, two-tenths; old wheels, two-tenths; stone coal strong iron, one-tenth; refined cast iron, two-tenths. Cold blast strong iron, four-tenths; refined cast iron, six-tenths. Hot blast strong iron, four-tenths; refined cast iron, six-tenths. Hot blast soft iron, five-tenths; refined cast iron, five-tenths. Cold blast soft iron, five-tenths; refined cast iron, five-tenths.

There is no more waste when I use six-tenths of the refined cast iron than when I only use three-tenths or one-tenth, as it melts or fuses equally and regularly with the other iron, and mixes thoroughly. I cannot state any one certain mixture or proportion of the refined cast iron that I use; it is left to the judgment of the man who has the charge of mixing the irons, as it is in all cases where he can perceive the qualities of his strong or soft irons. If the iron is of a very soft nature, it requires more of the refined iron to give the desired chill than when the iron is a little harder.

My refined iron can be used to any extent, as may be desired, without any more waste than when only a small portion is employed.

Any cast iron will give the desired chill when refined, even the most common stone coal or anthracite soft gray iron, to the best cold blast charcoal soft iron that has no chilling properties before refining. I contemplate using this fined cast iron from one-tenth to more than five or six tenths, if the quality of the soft pig requires it. My invention is chiefly based on the discovery that fining or partially refining iron which was not adapted for chilling imparts to it a chilling property.

The invention is not limited in its application to the use of iron refined by my peculiar process, but may be applied, though less economically, by the use of cast iron refined by other modes. My composite iron is not limited in its utility to the production of chilled castings, but is useful for castings in general where the metal is especially required to possess great strength and hardness—as, for example, in rolling mill rolls, cog wheels, &c., whether chilled or not.

Claim—1. The composite cast iron herein described, consisting of fined or partially refined cast iron and soft gray cast iron fused together.

2. The combination of a fined or partially refined cast iron with a soft gray cast iron for the production of chilled castings, or for other purposes.

IMPROVEMENT IN THE MANUFACTURE OF BESSEMER STEEL CONVERTER TUYERES.

Specification forming part of Letters Patent No. 144,736, dated November 18, 1873, issued to James E. Atwood, of Pittsburgh, Pa.

This invention has for its object to improve the construction of the tuyeres employed in the process of manufacturing Bessemer steel, in order to render the same more durable in use and simple in construction than others heretofore made. The invention consists in forming the tuyere of a refractory material, such as Jersey clay or other fire-brick clay, combined with fine molding sand or loam, the various materials being intimately mixed and molded into shape with the necessary cylindrical or conical shaped blast openings, and subsequently subjected to a baking process, until the tuyere presents a dark yellow color, which determines the completion of the baking operation.

A tuyere composed of the materials specified differs in many important respects from the tuyeres now in use, whether composed of fire clay or of a carbonaceous material, for the latter are, in a comparatively short time, worn off or disintegrated, so far as the surface exposed to the metal is concerned, while in a tuyere constructed according to my invention the air, in its passage through the blast holes, will tend to vitrify the surface with which it comes in contact, and also cause the top of the tuyere to become vitrified to such a depth that the molten metal cannot wash away or enlarge the blast holes as in clay tuyeres.

As heretofore made, tuyeres would, at the best, last but from three to six heats, or "blows," while, by actual practice, it has been found that tuyeres formed according to this invention can be used for as many as twenty-five to thirty-five heats before being rendered useless. It has also been found that the original form or dimensions of the blast holes are preserved to a great extent during a constant use of the tuyere, and, therefore, no apprehension need exist as to the wearing away or enlargement of the inner surface thereof, as in the old form of tuyeres.

The materials used in the formation of the tuyeres are combined in about the proportions of one-half loam or molders' sand and one-half of fire or other suitable clay, for it has been found that the vitrification and solidification of the materials occur with greater certainty and dispatch when so combined.

The dark yellow color of the tuyere is due to the fact that the component materials thereof, when subjected to heat, will be converted to the color stated, and serve to indicate when the tuyere has been subjected to the requisite degree of heat.

Claim—A tuyere manufactured in the manner described presents a glossy appearance, and possesses a better finish than those heretofore made from carbon, old crucibles, clay, &c., being also decidedly superior in many respects to the latter.

A tuyere for the manufacture of steel by the

Bessemer process, composed of fire-clay and loam or molders' sand, prepared substantially as described, for securing the vitrification of the tuyere, as specified.

The Old Dominion Iron and Nail Co.,

of Richmond, as well as others, have an outer or false door to their puddling furnaces, to protect the men from the heat. This outer door is best when made of cast iron; but is sometimes simply plate iron. A small crane attached to an adjoining furnace plate is what the false door is hung to, which allows it to be conveniently swung aside when the heat is to be drawn, or the furnace opened for any purpose. Quite a difference in the temperature in front of the furnace is found when using this protection.

Hardening Lead.

Lead which contains sulphur is so much harder than pure lead that galena or native sulphide of lead is often fused with the lead to give it hardness. A small quantity of antimony has the same effect. By combining the two processes and smelting together five parts by weight of lead to one part sulphure of antimony, a bright hard regulus is obtained, which may be added to ordinary soft lead in suitable quantities to produce the desired hardness. By fusing two parts of galena and one part sulphide of antimony, sulphurous acid is given off, and a regulus of hard lead is obtained similar to the above, and consisting of sulphide of lead and antimonu-retted lead.

The abandonment of wooden buildings, and the substitution of iron for rolling mill coverings, is a matter that is now more fully considered than a few years since, and is the result of that wisdom which is the outgrowth of experience, and is one of those things that evinces the tendency of the iron men of this country in their views toward a permanency of investment; that is, to look upon their business as their life's occupation, so that in making additions and improvements, to do it in a way that will not leave it to appear that it is but for the present, but that they intend to continue in the business. The Bethlehem Iron Co., Pa.; New Albany Rolling Mill Co., Ind.; Phoenix Iron Co., Pa.; Lewis, Oliver & Phillips' new puddle mill, South Side, Pittsburgh, and others who have put up buildings entirely of iron, have no reason to be dissatisfied with what they have done. The cumbersome nature of heavy wooden buildings, as well as their liability to fire and the frequent necessity for repairs, are against them. The proprietors of such buildings need not, and we believe do not, carry insurance.

The circular heating furnace, of Mr. Henry Chess, is coming into general use in the nail factories of the West. It has now been in use at the nail works of Chess, Smyth & Co., Pittsburgh, Pa., some two years or more. The furnace is circular in form with the ash-pit beneath, and a stack rising from the center of the furnace; around its side, at regular intervals, are some eighteen or twenty openings covered with small doors, with but one stove hole; the fire occupies the center of the furnace, and by a peculiar arrangement of flues, each end of the small nail plate pile is equally heated. It will be understood that this furnace is used for heating the piles for the nail machines.

Recent statistics of French iron manufacture show that France is making rapid progress in the development of iron, steel and hardware production. M. Deseilligny, Minister of Commerce, has recently been making a tour of the French iron works in the southern and central districts, and gave the following exposition of his views at Lyons. He remarked that he was firmly convinced that French trade and manufactures could only prosper by the devising means of transport and cheap production to enable France to compete successfully with foreign countries. He laid great stress on the importance of inland navigation, and said he contemplated the creation of a huge canal to establish a water communication between the Channel and the Mediterranean. He announced that he intended to do all he could to increase the produce of French coal mines. As to the iron-mining districts of the Loire, he stated that their produce might and would be doubled. This year they had turned out 4 millions of tons, and that amount would be surpassed in 1874. He added that, unfortunately, the very increase of the production of the smelting furnaces would contribute to keep up the high price of coal—but as a set off, he said that the metallurgical industry of France was in a position to compete successfully with the most renowned English cities, and that this favorable state of things should encourage them in their efforts to conquer a predominating position on all the markets of the world.

Recent experiments in England in the preservation of iron surfaces show, it is said, the advantage of coating such surfaces with heavy mineral oil. The action of such oil is said to be twofold. It is detergent when freely and vigorously brushed over an already rusted surface, seemingly loosening the bulk of the rust, while it also darkens that which remains; and it likewise acts as a varnish if applied after the cleansing has been effected, or to new and bright work. Its superiority to vegetable or animal oils depends upon the fact that the bulk of the oil evaporates, and it leaves only a very fine film behind. If the oil is light, and fully refined, it evaporates so completely as to do but little good in this way; but, if tinged or "once run" oil of sufficiently high gravity be used, the resinous or carbonaceous matter which gives the tinge to the oil remains behind, and forms the thin protecting film of varnish. Ordinary varnish leaves far too thick and obvious a film, while the film of the once-run oil does its work of protection without displaying itself. As regards the density of the oil required for this purpose, that which stands between the burning oil and good lubricating oil is found to be the best.

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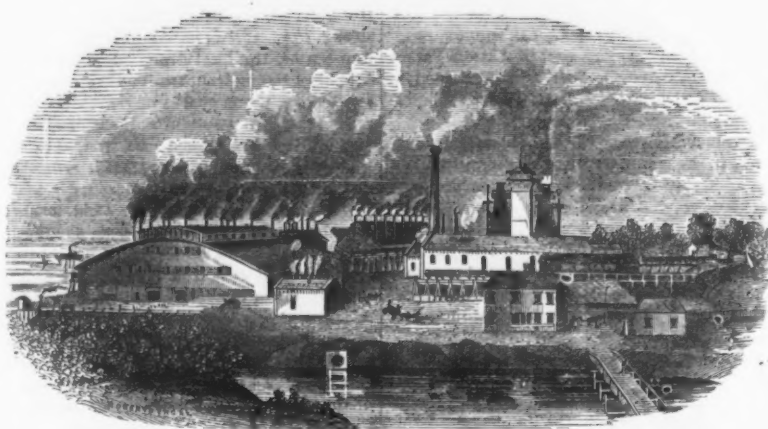
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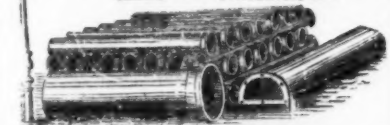
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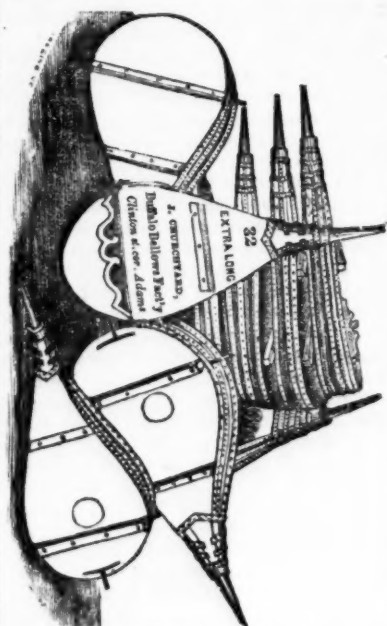
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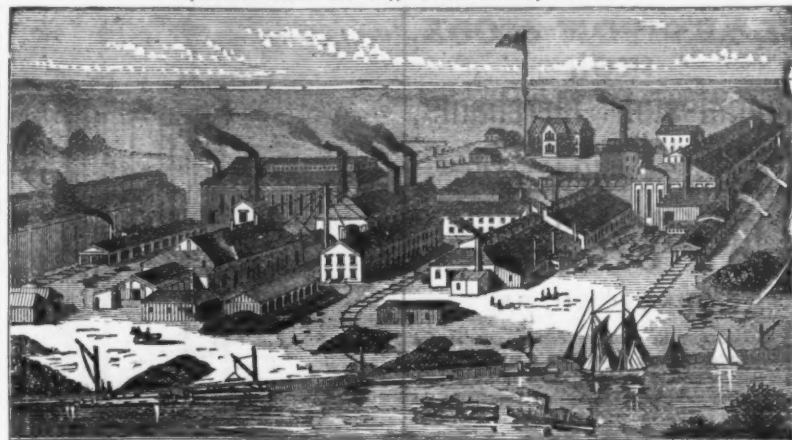
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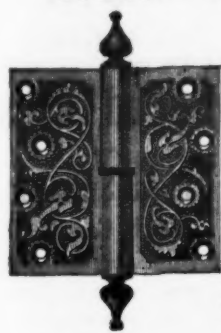
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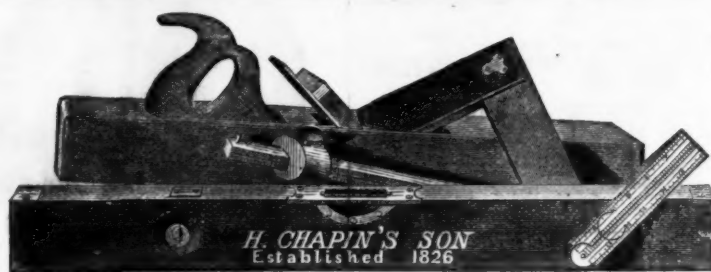
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The Copper and Iron Statistics of Lake Superior.

We take the following from the Portage Lake Mining Journal:

By comparing the totals in our copper tables it will be seen that the production in 1873, in the Portage Lake district, exceeds that of last year by 2572 tons, while in the Keweenaw Point district the product for the year just closed foots up 945 tons more than in 1872. Ontonagon has fallen off, but we hope there is better days in store for this pioneer district. It will be seen by the grand total given that the yield of the three districts net 18,514 tons of mineral, or about 14,500 tons of ingot copper. This is the largest amount of copper ever obtained in one year from the copper mines of Northern Michigan. Comment here is unnecessary; the array of figures we publish below carry with them their own story. We look for even better results than this next year. Nearly all of the mines which helped to make up this large yield, were never looking better than they are to-day, while the prospective features of at least two new concerns—the Osceola and Allouez—are such as to warrant the belief that they will contribute an amount of copper toward the product of this district in 1874:

PORTAGE LAKE DISTRICT.		Tons.	Pounds.
Calumet and Hecla, for year ending Nov. 30, 1873.	11,651	1,938	
Quincy, for year ending Nov. 30, 1873.	1,600	180	
Franklin-Pewabic, for year ending Nov. 30, 1873.	671	1,673	
Atlantic, for broken season.	464	701	
Houghton, for year ending Nov. 30, 1873.	285		
Schoolcraft, for year ending Nov. 30, 1873.	270	1,530	
Concord, for year ending Nov. 30, 1873.	73		
Isle Royale, for year ending Nov. 30, 1873.	143	1,417	
Albany & Boston, broken season.	50		
Summer, for year ending with close of navigation.	77		
Other sources.	8		
Total.	15,194	1,489	
Product in 1872.	12,612	319	
Increase in 1873.	2,582	1,110	

KEWEENAW POINT DISTRICT.		Tons.	Pounds.
Central, for year ending Nov. 30, 1873.	1,031	1,968	
Copper Falls, for year ending with close of navigation.	894	927	
Phenix, for year ending with close of navigation.	350		
Cliff, for year ending with close of navigation.	270	1,364	
Rockland, for year ending Nov. 30, 1873.	309	500	
St. Clair, for year ending Nov. 18, 1873.	55	742	
Amysdaloid, broken season.	19	303	
Other sources.	2	184	
Total.	2,781	1,903	
Product in 1872.	1,836	894	
Increase in 1873.	945	1,009	

ONTONAGON DISTRICT.		Tons.	Pounds.
Ridge.	180	113	
National.	131	318	
Minnesota.	103	1,700	
Flint Steel.	45	1,326	
Bohemian.	40	500	
Knowlton.	39	1,864	
Rockland.	16	460	
Mass.	6	868	
Adventure.	3	1,238	
Tremont.	2	700	
Total.	537	1,117	
Product in 1872.	725	1,000	
Decrease in 1873.	187	1,883	

RECAPITULATION.

	Tons.	Pounds.
Portage Lake District.	15,194	1,489
Keweenaw Point District.	2,781	1,903
Ontonagon District.	537	1,117
Grand total for 1873.	18,514	449

We are indebted to the Marquette Mining Journal for the following exhibit of the iron business up to the close of navigation.

The following is a statement of the shipments of iron ore and pig iron from the port of Marquette:

IRON ORE.		Previously reported.	Past week.	Total.
Company.				
Cleveland.	73,673	123,386	..	197,059
Lake Superior.	123,386	..	..	123,386
Champion.	63,165	..	..	63,165
Lake Angeline.	15,361	..	..	15,361
Washington.	37,216	..	..	37,216
Edwards.	37,348	..	..	37,348
McComber.	28,388	..	..	28,388
Winthrop.	6,232	..	..	6,232
Republic.	89,027	..	..	89,027
Albion.	1,196	..	..	1,196
Keyconer.	10,047	325	..	10,372
Shenango.	7,323	..	..	7,323
Himrod hematite.	2,065	..	..	2,065
Rolling Mill.	4,462	..	..	4,462
Kloman.	21,371	..	..	21,371
Hungerford.	35	..	..	35
New York.	1,863	..	..	1,863
Total.	525,939	325	..	526,264

PIG IRON.			
Champion furnace.	3,678	34	3,712
Morgan furnace.	4,560	25	4,585
Michigan furnace.	3,083	192	3,275
Greenwood furnace.	2,440	302	2,742
Bancroft furnace.	3,313	614	3,927
Grace furnace.	5,454	198	5,652
Collins furnace.	1,830	..	1,830
Iron Cliff furnace.	60	..	60
M. & P. rolling mill.	283	..	283
Total.	34,782	1,365	36,147
Total ore and pig iron.	560,671	1,690	562,361

The following is a statement of the shipments of iron ore and pig iron from the port of Escanaba up to and including the 19th day of November:

IRON ORE.		Gross tons.
Mine.		
Jackson.	104,482	
New York.	61,554	
Cleveland.	50,423	
Angeline.	28,581	
Barnum.	48,073	
Foster.	27,565	
Cascade.	16,341	
Keyconer.	7,472	
Grand Central.	6,527	
Smith.	9,338	
Green Bay.	932	
Allen.	510	
Winthrop.	21,922	
Bagley.	13,775	
Section 18.	1,404	
Emma.	7,186	
P. & L. B.	21,466	
Carr.	1,441	
Gribben.	3,541	
Saginaw.	35,404	
Rolling Mill.	7,446	
Goodrich.	8,538	
Howell Hoppeck.	1,239	
Home.	1,091	
Total iron ore.	479,713	

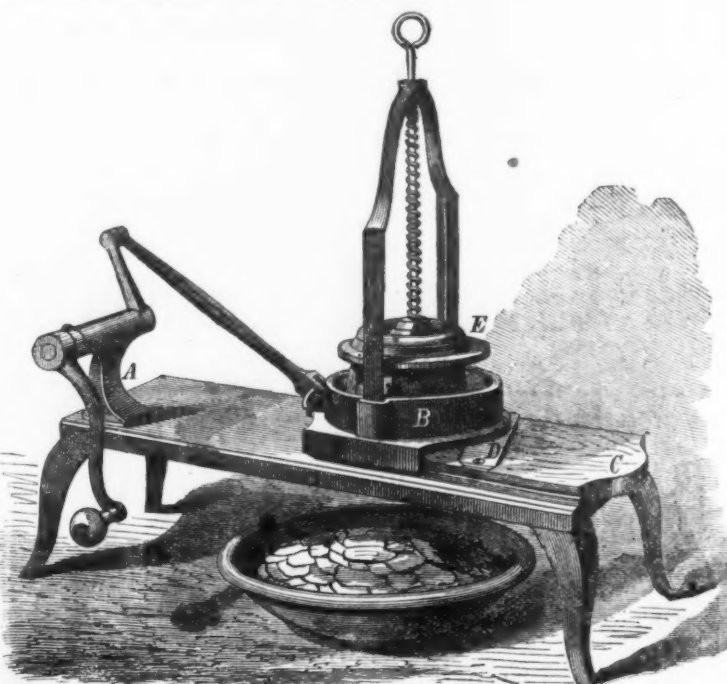
FIG IRON.		
Pioneer.	3,817	
Deer Lake.	3,255	
Escanaba furnace.	2,178	
Total pig iron.	9,248	
Total ore and pig iron.	488,960	

The following is a statement of the shipments of ore from the port of L'Anse for the season:

Gross tons.	
Spurr Mountain.	31,933
Michigan ore.	28,966
Total.	60,899

Fruit and Vegetable Slicer.

Our engraving represents an ingenious little device for slicing potatoes, fruit, etc., preparatory to cooking. The mechanism is quite simple, and its work, judging from the performance of the machine sent us for examination, is expeditiously and nicely done. The hand crank shown actuates a shaft in the fixed standard, A. On the end of this shaft is an arm connecting, by means of the rod shown, with a bottomless metal receptacle, B. The latter has suitable flanges and projections, which, working in side grooves, confine its to and fro motion, caused by turning the crank, to the extent of the piece C, which, it will be noticed, is elevated above the platform. The cutting



FRUIT AND VEGETABLE SLICER.

The International Bridge.

apparatus is simply a two edged blade, D, in a slot in the bed piece, C. It is set at an angle, thus giving a drawing cut to the article brought against it.

Two bent standards are connected with the receptacle, C, and through their point of junction above passes a rod which is surrounded by a spiral spring, and carries at its lower end a follower, E. When the fruit is placed in the receptacle, B, this follower in pushed down upon it by the expansive force of the spring. The crank is then rotated, and the fruit and its holding apparatus caused to travel to and fro along the bed, C. The spring continually presses the fruit down, so that the blade, at each movement of the receptacle, B, across it, cuts off a thin slice, which falls through the slot into a dish below.

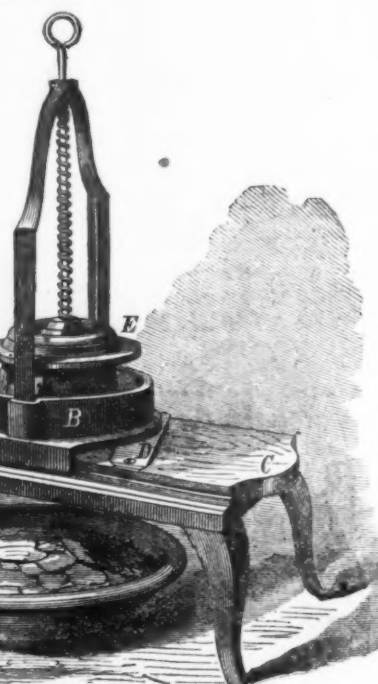
For further information regarding sale of rights, etc., address the inventor, Mr. F. C. Vibert, Hockanum, Conn.—Scientific American.

The Ward Gun.

Several important competitive tests of heavy ordnance have recently been made by the government ordnance officers at Boston. For the purpose of the experimental test there were provided two guns of 23 tons each, and of 13 inch calibre. One of them was the common smooth-bore, and the other was rifled in accordance with Mr. Ward's invention, but in other respects there was no difference whatever. One hundred and forty pounds of powder—the largest quantity of ammunition ever used in a gun—was fired from each, and the projectiles were respectively of 460 pounds weight. The targets consisted of wrought iron plates of 15 inches in thickness; and they were erected side by side, 150 feet distant. The projectile was conical, while the one fired from the common smooth-bore piece was necessarily round. The one first named went clean through the 15 iron plates, and out of sight into a sand bank in the rear. The demolition of the almost invulnerable target was complete, and so great was the force with which it was struck that a fragment of 300 or 400 pounds was thrown clear across the island, a distance of not less than a quarter of a mile. The projectile from the smooth-bore gun penetrated the target only about 6 1/2 inches, and, as the advantages were precisely equal, the superiority of the rifled arm was at once established by the experiment, and admitted by the government authorities of observation. Compared with other comparative tests, this style of gun is the most destructive ever yet produced. A 35 ton gun of 12 inch calibre was once fired in England through an iron plate of 12 inches in thickness, showing the comparative penetrating power of that arm to be about 144 against 225 of the gun at Nut Island. This improvement, as the government understands it, does not involve the manufacture of new guns to secure it. Take the present armament of our forts, just as they are, and they can be rifled at one-tenth the cost that new guns can be manufactured, and, at the same time, their efficiency as smooth-bore ordnance

is not in the least impaired; and, including the cost of rifling, the arms will be cheaper by one-tenth than the best English guns, and for destructive powers their efficiency can hardly ever be equalled.

Under this improvement it is claimed that the rifled guns belonging to the United States government may be made to have greatly increased efficiency, endurance, penetration of iron plates, higher initial velocity to the shot, much longer range and improved precision; while the guns of the smooth-bore will remain essentially as good, or be better, smooth-bore guns than they now are, and, if rifled, they may be, after the improvement is applied, used effectively as smooth-bore guns if desired. By this means all the spherical projectiles now on hand may be utilized, and all carriages, implements, platforms, ordnance stores and service of the gun may be made available. The improvement consists in rifling each gun with two grooves, having for a 15 inch gun a twist of about one full turn in 50 feet, and so stationing the grooves at the side of the bore that neither groove will intersect or cross the bottom or top of the bore, thus leaving it smooth at the bottom and top where the shot would strike in "ballotting," should the gun be used as a smooth-bore for spherical projectiles after being rifled.



The following particulars of the newly completed railroad bridge over the Niagara River at Buffalo, will be read with interest:

The entire length of the bridge is about three-quarters of a mile. But more in detail the length is as follows: In the main river, 1800 feet; over Squaw Island, 1300 feet (trestle work), and over Black Rock Harbor, 450 feet. The entire length of the superstructure in the main river is 1800 feet; in Black Rock Harbor, 440 feet. There are nine spans in the portion on the main river and three in Black Rock Harbor; four of 190 feet in the clear, and three of 200 in the clear. Over the main river also are two draw openings, of 160 feet each; total length of draw girder, 323 feet. In Black Rock Harbor are two draw openings of 90 feet each, and one fixed span 230 feet in length. In the main river are eight piers and two abutments; and in the harbor two piers and two abutments. The abutments are 40 feet long by 30 wide, at the bridge seat level. Over the bridge is laid a track for railroads, and a common sidewalk for foot passengers. The piers and abutments are built of sandstone from Georgetown and Acton, Canada, and Berea, near Cleveland, Ohio. The iron of the superstructure was from the Phenixville Iron Company's Works, Phenixville, Penn. The first caisson was launched on the 13th of July, 1870, and work progressed steadily up to the time of completion. It must be remembered that the current of the river, at the point where the bridge is located, runs from five and a half to ten miles an hour, according to the state of the wind. This was throughout one of the greatest difficulties encountered and frequently retarded progress. Then, too, the depth of water varies from twelve to forty-five feet. The ice in winter, some may think, would damage the bridge in course of time, but the ice breakers afforded ample protection, and cut to pieces blue ice two feet thick with comparative ease. Another remarkable thing connected with the history of the bridge is that, during the whole course of the work, not a single life has been lost. The workmen have, many of them, often been exposed to danger, but always have escaped.

The bridge has been leased to the various railroads which will cross it, for twenty years. The roads are the Great Trunk, the Great Western, the Canada Southern, the New York Central, the Erie, and the New York, West Shore and Chicago. Most of these railroads have already constructed their approaches to the bridge, and will commence sending trains across at as early a day as possible. The original plan contemplated a carriage way, but this was abandoned for the reason that, as the bridge was three-quarters of a mile long, and so many trains were to cross it, there would very seldom be a chance for carriages to cross without interfering with the trains.

The entire cost of the bridge, in round numbers, is not less than \$1,500,000. Of its practical benefits we leave the reader to judge, merely stating in conclusion that it supplies a want long felt by the different railroads which have for so many years been obliged to cross the Niagara River on the steamer International.

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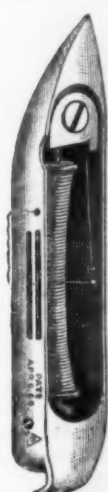
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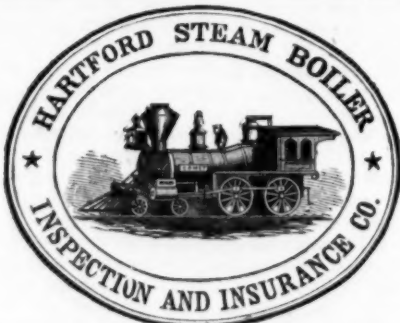
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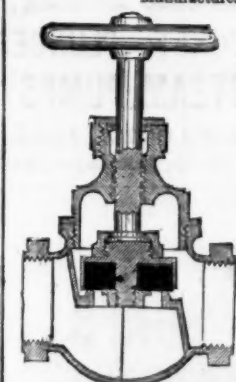
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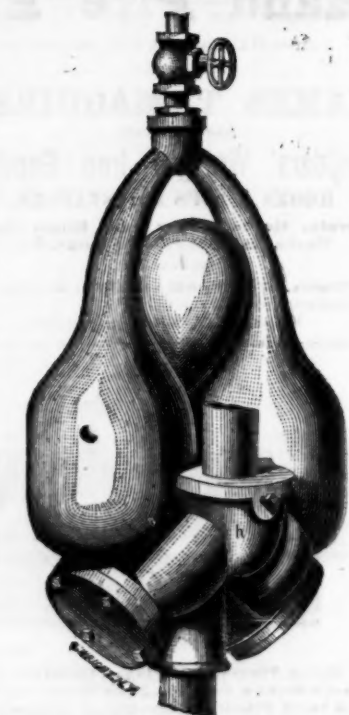
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One-sixteenth to five-eighths diameter, heads and points to sample.

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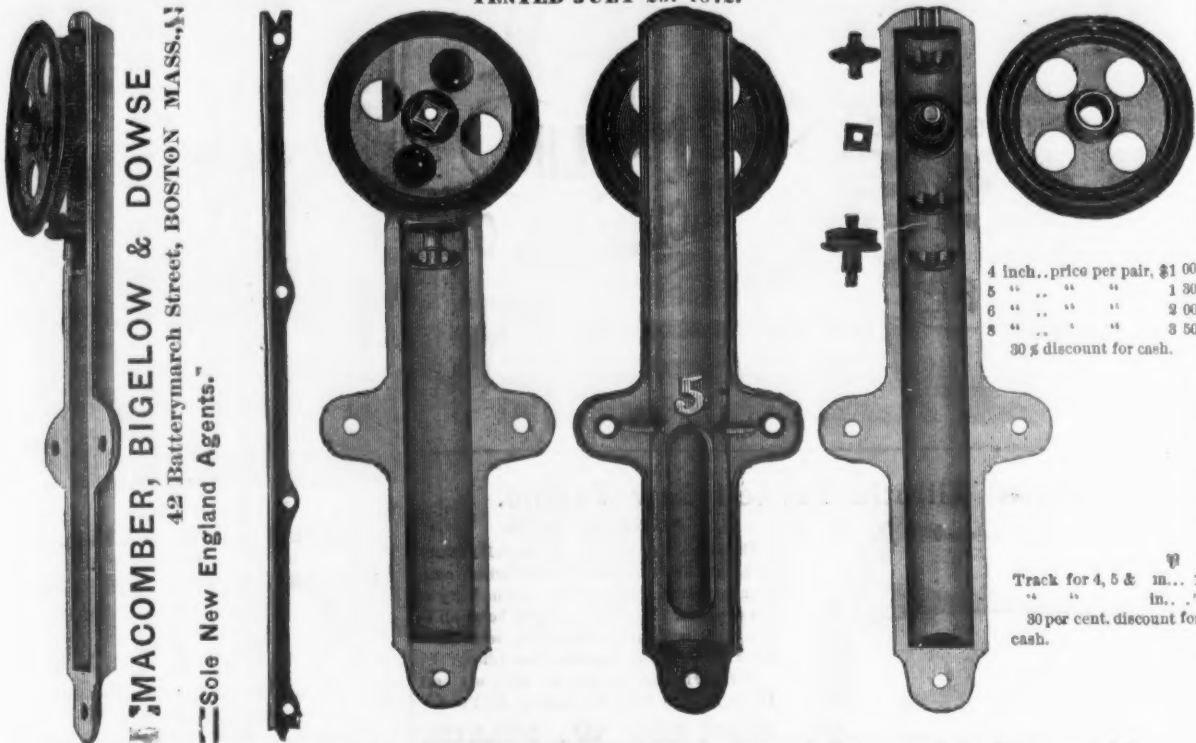
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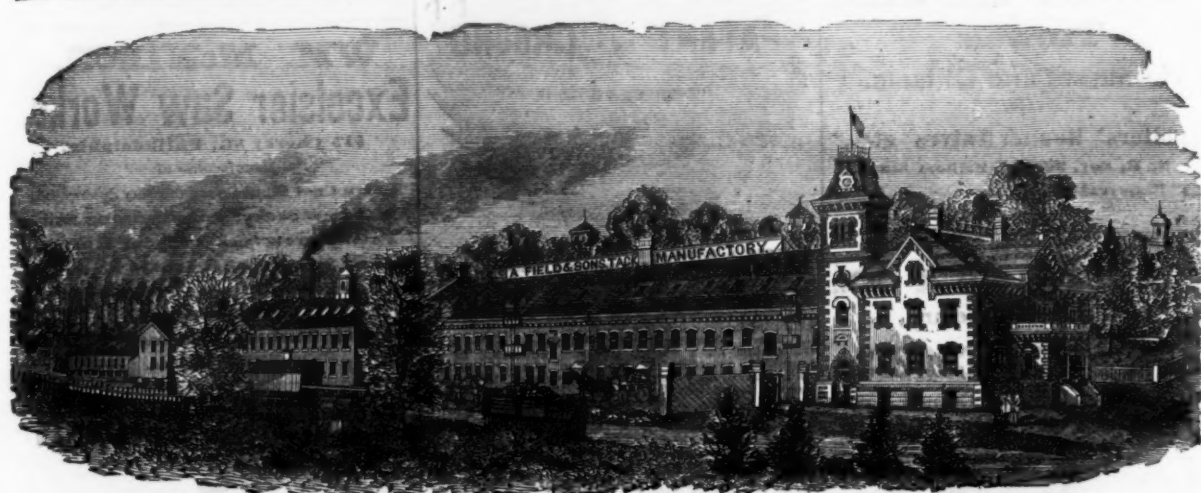
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We, without hesitation, offer this Hanger as the best article in the market for the purpose. Its many advantages over all other Hangers are as follows:
 1st.—It is more than double as strong as any other Hanger, owing to its semi-cylindrical or curved back.
 2nd.—It is provided with a friction wheel at the top of the Case, which bears against the rear or outside of the sheaves, and prevents it from leaning out-ward and causing it to RUN TRUE, a feature not attained in any other Hanger.
 3d.—By thus causing the sheave to run true, the doors are always held up Close to the Frame, and maintain a close joint around it.
 4th.—The sheave has but one flange, there being a lower friction wheel provided with a flange which extends out under the face of the sheave and bears against the outer side of the track, which takes the place of the extra flange in the sheave, thus doing away with the grooved sheave which always grinds or breaks.
 5th.—IT CAN NEVER RUN OFF THE TRACK.
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Also Agents for the CONNECTICUT CUTLERY CO., of Naugatuck, Conn., and keep on hand a complete assortment of their goods.



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Copper and Iron Tacks, Tinned Tacks,

SUPERIOR SWEDEN IRON TACKS, for Upholsterers' Use, Saddlers' Supply, Card Clothing, etc., etc.

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Zinc and Steel Shoe Nails, Carpet, Brush and Gimp Tacks, Common and Patent Brads, Finishing Nails, Annealed Trunk and Clout Nails, Hob and Hungarian Nails,

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Any variations from the regular size or shape of the above named goods made from samples, to order.

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FURNACES & MINES.

New Union Steam Safety Elevator,

How One Works.

RIVERSIDE IRON WORKS, DEWEY, VANCE & CO.,
Wheeling, W. Va., January 14th, 1873.

Dear Sirs: The experience of a year proves that your Furnace Elevator is superior to all others in use. We have in the six weeks from December 1st to Sunday last, made 2734 tons, 1401 lbs. Pig Metal, or an average of near 65 tons per day, which required the elevator to lift 72 feet high 4½ tons Ore, Coke and Limestone for each ton of metal produced, or more than 11,500 tons material in the 6 weeks. The largest yield in one day was 81 3-4 tons Iron, involving the lifting of 345 tons material in 24 hours. This has all been done to our satisfaction, and that, too, in the coldest weather we have had. Other furnaces with water and pneumatic hoists have experienced great difficulty, on account of the water freezing in the tanks; and in the case of the air hoists, we understand that two furnaces, not far from us, had to "blow out," from being unable to hoist stock during the "cold snap." The difficulty, we are told, was caused by the condensed moisture in the blast freezing to the sides of the cylinders, so that the piston could not move up or down. Very truly, yours,
DEWEY, VANCE & CO.

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348 Broadway, NEW YORK.

Over 60,000 Sold.

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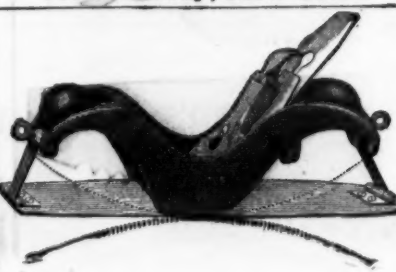
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Iron Founders,

MACHINISTS,

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LIGHT WORK of all kinds.

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Plain and Ornamental
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20 to 30 Morton, and 57 to 65

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EAGLE IRON FOUNDRY.

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OHIO TOOL CO.,
Manufacture
Planers, Moulds, Bench, Plane Irons, Screws, Hand Screws, Hammers, Chisels, Files, and Saw, Frame Saws, Framing Chisels, Drawing Knives, Coopers' Edge Tools, Tree Hooks.

Clark, Wilson & Co., Agents, 81 Beekman St., N. Y.

BUSINESS ITEMS.

NEW YORK.
The employees of Knickerbocker's axe and soythe works, at Ballston Spa, have submitted to a reduction of fifteen per cent. in their wages.

PENNSYLVANIA.
The Glen Rolling Mill, of Allentown, has commenced operations again. The puddlers refused to accept the terms offered by the directors, hence the mill runs on scrap iron. The company received quite a number of heavy orders, and, although they are compelled to decline some on account of the inadequacy of the price offered for finished iron, they believe that they can continue without another stoppage.

The Tube Works, at McKeesport, are giving employment to 200 hands. The *Purdon* says that by the latter part of the month this number will be increased to near 600. Nearly 700 were employed previous to the panic.

The Pascal Iron Works, Philadelphia, Morris, Tasker & Co., are now finishing up on their contracts for the gaslight companies of New Orleans, Columbus, and Troy, which add to their long list of gasometers, holders, hydrometers, &c., placed in about thirty cities of the Union, those at Baltimore, Cincinnati, Lynn, Cleveland, Harrisburg, Yonkers, and Jersey City being the largest.

The Connellsville Car and Machine Shop Company has moved into its new shops at Connellsville. The shops are full of work and the company has a full force of men employed.

The rolling mill at Greenville and Westernman's mill, at Sharon, have stopped, owing to a strike of coal miners.

Nearly all the manufacturing establishments at New Castle are now in operation, the miners having resumed work.

The large Millerstown furnace is approaching completion. It will be ready for blast about the 1st of April.

The Montgomery Iron Company's furnace is now employing a full force and pay regular wages. In the Lehigh and Schuylkill regions numerous furnaces which were "blown out" have been "blown in," and where there was general dullness recently now much activity is manifested. Much of the business in the iron regions is attributable to the government contracts that have been given out to the iron masters.

On the 7th inst. the machine shop connected with the Bessemer Steel Works, at Baldwin, three miles east of Harrisburg, was destroyed by fire.

The Harrisburg car shops will resume work on the 1st of January next with a full force of workmen.

It is rumored, says the *Allentown Chronicle*, that some of the puddling furnaces of the big mill of the Allentown Rolling Mill Company will commence work soon. Pig iron is being stacked at the mill, and all appearances indicate a resumption of the puddlers' work.

The Phoenixville Iron Works are among the oldest in the United States, being erected in 1790, and passing, in 1827, into the possession of the late Daniel Reeves, who by his energy increased their capacity, till they now employ constantly over 1500 hands, being now of the largest manufactures of iron bridges in the country. They ship their bridges to Canada and South America, and are now in negotiation for large orders in British India.

Carnegie, McCandless & Co., of Pittsburgh, have commenced building the Edgar Thompson Bessemer Steel Works, eleven miles east of that city. The capacity will be 125 tons of rails a day.

The Pennsylvania Railroad Company's Car Works, at Altoona, give employment to about 3000 hands. The average capacity of the works is from 75 to 80 cars a week. In 1872 11,246 cars passed through the shops. The passenger shop is 70x350 feet. The freight shop is a round house, 450 feet in diameter. The cabinet shop is 300x75 feet; tinmith shop, 40x60 feet; machine shop, 75x125 feet; blacksmith shop, 75x300 feet; planing mill, 72x300 feet. The machinery is driven by an engine of 175 horse-power.

An order has been received by the Atlas Foundry Company, at Pittsburgh, from the Tredegar Iron Works, of England, for a supply of the Pearte pit-car wheels. These wheels are designed for use in mines, and many of them are in use in Pennsylvania and Ohio. The company are full of orders, and the works are running on full time.

The puddlers employed by the Bethlehem Iron Company have decided to accept the terms offered—\$4.50 per ton—and the mill has resumed operations.

MASSACHUSETTS.
Dunbar, Hobart & Whidden, of South Abington, are enlarging their works preparatory to engaging in the manufacture of horse shoe nails.

Owing to the breaking of a bolt connected with the bed work of the upright engine in the large merchant mill of the Franconia Iron and Steel Company's Works, in Wareham, business will be suspended until the damage is repaired, which will probably take some three or four weeks, as the engine was also injured, to what extent cannot be ascertained until the machinery is taken down.

Business has again been resumed by the Bay State Cutlery Company, at Northampton, whose works are in operation, running six days per week, but only eight hours per day.

At Greenfield, the Greenfield Tool Company are running night and day on orders for their patent ox shoes.

The Wiley & Russell Bolt Cutting Machine Company, of Greenfield, are running on full time, and are well supplied with orders.

At the Metallic Art Works, in Watertown, the hours of labor have been increased from seven to nine.

Worcester is to have a new industry, the Sewing Machine Engine Company having moved from New York to that place. They manufacture steam engines to be used in running sewing machines. They are small, simple, effective, and cheap. They have been thoroughly tested, and are found to work satisfactorily. The company have a capital of \$300,000, and are making 50 machines a week. They expect to employ about 50 hands, and to turn out 50 engines a day. The boiler of this engine is about 24½ inches, and the cylinder one inch in diameter, with a stroke of two inches.

CONNECTICUT.
The Burloch street factory, at Bridgeport, is again in operation. Also the Totoket Mill, at Occum, with a reduction in wages of seventeen and one-half per cent. T. Lewis & Co., at Naugatuck, will soon resume work with a full set of hands. The Quinnabaug has not shortened up during the panic.

The Yale Lock Company, of Stamford, has completed its new and well arranged brass foundry building, and the men have been at work in it for a fortnight. The company is now building another addition to its factory, to be used as a boiler room, in which will be placed an engine of 62 horse-power.

The Bridgeport Iron Works are running 15 hours a day, and have work enough to last till April. They employ a larger force than ever before.

The New Haven Nut Company, whose works at Westville, were recently burned, are very busy rebuilding, and the new buildings will be finished in less than a month.

VIRGINIA.
The Chilhowee Iron Company propose to erect a blast furnace at Marion, Smyth county. They are now making brick for their works.

Parties in Philadelphia, practical men as well as capitalists, are making inquiries for a proper site in Alexandria, for an iron furnace and rolling mill, to be established there at an early day.

Grace Furnace (an old one), situated in Botetourt county, is now being fitted up by the Tredegar Iron Company, of Richmond, and will go in blast in March next. The motive power consists of an engine with a vertical cylinder (the cylinder beneath) and three boilers, which will be heated by gas taken from stack six feet below tunnel-head. The stack is 33 feet high and 9½ feet at boshes, with open top. Expected capacity, forty-five to fifty gross tons per week. Fuel, charcoal; ore, principally brown hematite.

GEORGIA.
The Tecumseh Iron Company are building a charcoal blast furnace at Tecumseh. It will be 60 feet high, and 12 feet at boshes, and it is expected, will go in blast the first of January. A party of English capitalists have paid \$125,000 for 4000 acres of land adjacent to Bell's Landing, on the Tennessee River, about thirty-five miles from Chattanooga. The purchase is rich in iron.

Ridge Valley is the name of a new blast furnace that is being built eight miles from Rome, by the Ridge Valley Iron Company. Height 45 feet, boshes 10 feet. Estimated capacity, 70 tons per week of cold blast charcoal iron. Ore, brown hematite.

OHIO.
An increase from \$300,000 to \$450,000 has been made in the capital stock of the Akron Iron Company.

We understand, says the *Ironton Journal*, that the Belfont Iron Works, of this city, have bought fifteen hundred tons of gray forge iron, delivery to commence December 1st, 1873, at the rate of five hundred tons per month, at \$23.25 per ton, three months' time. This is the lowest purchase of good gray forge iron that we have heard of for years. It was made in consequence of the Belfont furnace being out of blast for repairs.

The Eclipse Iron Works, owned and operated by Messrs. Stoney, Chambers & Macbeth, at Cleveland, is still in successful operation, with orders ahead, and turning out castings of all kinds and of the best quality. They give particular attention to rolling mill, car, bridge and builders' castings. They also make patterns of all kinds to order. They are skillful mechanics and perfectly up in their business. Their works are at the corner of Centre and Second streets.

The Ashtabula, Youngstown, and Pittsburgh Railroad Company is building a machine shop near its large brick round house at Ashtabula Harbor.

Ward's Nail Works, at Niles, are doing a driving business, running double time, and employing 75 men. The building occupied by these works is 100x300 feet, two stories high. There are 44 nail machines, 14 boiling furnaces, two heating furnaces, one 18 inch muck train, and one 16 inch plate mill. The daily product is 200 kegs of nails, of all sizes.

Two furnaces are to be built by the Huron Iron Company, of Jackson Co.

The machinery of the Triumph Foundry Company, of Jackson, has been sold to the Huron Company, and the above company dissolved.

The new foundry at Cambridge is in operation, and turned out its first work a short time since, running out about three thousand pounds of metal.

MISSOURI.
Two nickel furnaces are in process of erection in Madison county. The tin mining company have erected a furnace at a cost of \$150,000. One copper mine and four iron banks are being worked. Over half a million dollars' worth of nickel has been shipped within the last three years. This county excels any spot in the world for the number and wealth of its mines.

ILLINOIS.

The Meir Iron Company, which was organized about a year ago, with a capital stock of \$1,000,000, purchased a piece of land in St. Clair county, opposite South St. Louis, broke ground on the first of October last, has nearly completed a fine office building, 35x70 feet, two stories, and a boarding house, 24x48 feet, two stories, and will next erect two blast furnaces with 17 feet boshes. The work of driving 600 piles for the foundation has commenced. The casting house and the finishing house will be 70 feet wide by 160 feet and 202 feet long, respectively.

The Mineral Point Zinc Company, at La Salle, have only temporarily reduced production at their works 20 per cent. for needed repairs. They will soon be running up to their full capacity.

INDIANA.

New iron works are about being established at South Bend. A company in Geneseo, N. Y., propose uniting with an establishment already there, forming a new and heavy concern.

CALIFORNIA.

The Pacific Iron Works, San Francisco, are turning out one of the largest pieces of engine work ever made on that coast. The engine is an upright one, and is being made for the Pacific Rolling Mills to run an additional set of rolls. The cylinder is 30x32, and weighs about 7000 pounds. The frame weighs 24,000 pounds, the bed plate 30,000, and the fly-wheel 50,000 pounds. An upright engine of nearly the same size was made some years ago for the Savage mine by other parties. At this foundry they are making water wheel machinery and additional barrels, etc., for enlarging the quartz mill of the Bajada mine in Sonora, Mexico. They are also making machinery for increasing the capacity of the Homiguera mill, there being the iron work for six additional furnaces and a four stamp battery to be added to the mill. They are re-erecting the Auburn mill at Reno which is to be started up again under a new management. This is principally new pan work. They have lately been doing some iron work for the new ore reducing works at Wallbridge, and others in Brooklyn, Alameda Co. They are building some sugar-cane machinery to go to Mexico, and doing the usual amount of small work.

Iron manufacturing company has been organized at Ogden, under the auspices of prominent iron men of Pennsylvania, and parties have gone for the necessary machinery.

ILLINOIS.

The North Chicago Rolling Mill has suspended operations entirely. Some of the workmen were offered employment throughout the winter, but they not liking the manner in which they were to be paid, refused. The Union Rolling Mill is well employed, as the company has orders for all the iron rails they can manufacture before Christmas, after which time they will stop operations until February. Nothing has been done at the steel works for some time.

HENRY DISSTON & SONS'
SAW, TOOL,
STEEL AND FILE WORKS,
 Front and Laurel Streets,
 PHILADELPHIA, PA.

H. W. PEACE,
 MANUFACTURER OF
SAWS OF ALL KINDS.
 FACTORY, WILLIAMSBURGH, N. Y.

AMERICAN SAW CO.,
 No. 1 FERRY STREET, NEW YORK.



Solid saws require frequent gumming, thereby subjecting them to risk of springing or breaking. This is especially the case with cross cuts having Patent Teeth. In the perforated saws all gumming is avoided and the teeth are easily kept long and in proper shape, saving files, labor, expense and vexation. As is well known, our saws cut faster, smoother and easier than any other.

MOVABLE-TOOTHED CIRCULAR SAWS AND SOLID SAWS OF ALL KINDS.

Alexander Brothers,
 Manufacturers of OAK TANNED
Leather Belting
 412 North 3d, Philadelphia, Pa.

WM. H. STOYLE,
 MANUFACTURER OF
Machine Cut Belt Lacing,
 No. 403 Library Street,

BRADFORD & SHARP,
 Manufacturers of
Leather Belting
 OAK TANNED,
 57 Walnut Street, Cincinnati, O.

We furnish many of the largest Iron Mills in the West, and guarantee quality of all goods sold. Send for prices.

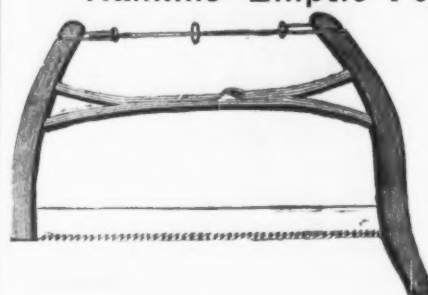


Putnam's Government Standard
FORGED
HORSE SHOE NAILS.
 Manufactured from the best of NORWAY Iron, and warranted to give entire satisfaction.
S. S. PUTNAM & CO.,
 NEPONSET, MASS.



Hankins' Elliptic Forked Saw Frame.

Patented June 28th, 1870.



This framed engraving represents HANKINS' ELLIPTIC FORKED SAW FRAME, which commands itself to the trade for its simplicity of construction. The Forked Braces being all in one piece, without any centre bolt, secures for the Frame great strength and durability.

These Frames are put up with my best Webs, marked "No. 40, Harvey W. Peace."

HARVEY W. PEACE
VULCAN SAW WORKS,
 WILLIAMSBURGH, N. Y.

W. ROSE & BROTHERS
 WEST PHILADELPHIA,
 Manufacturers of

Plasterers' and Brick
Trowels

Hammers and Chisels.

ALSO,
 Saddlers' Round Knives etc.,
 N. E. cor. 36th & Filbert Sts.
 Please send for Price List.

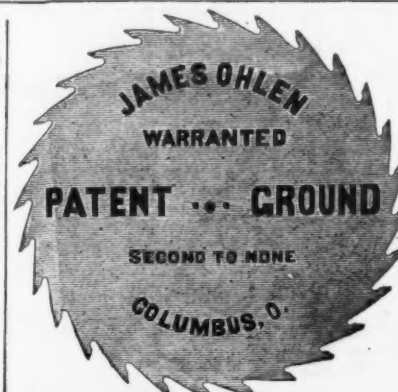
E. C. ATKINS & CO.,
 Indianapolis, Indiana,
Saw Manufacturers.

Best Cast Steel Patent Ground Saws,
 Also, sole Manufacturers of Atkins' Patent



CROSS-CUT SAW HANDLE.

Best Patent Handle in use.
 Manufacture and Office Nos. 210, 212, 214 and
 216 South Illinois Street.



I make a specialty of the LARGEST SIZES of Circular Saws, and call particular attention of lumber manufacturers to the following points of excellence: Evenness of Temper.—The peculiar structure of my furnace subjects all parts of the saw to a DEAD heat, and when dipped in the oil bath secures perfect uniformity.

Perfect Accuracy in Thickness.—My saws are ground on a patent machine, automatic in its operation, grading off the thick places upon the plate before the thinner parts are reached, and when the saw is removed BALANCES PERFECTLY, which is proof positive of the right accomplishment of the work.

Properly Hammered.—Great care is taken that no saw shall leave my works without due attention in this important particular. A saw too tightly strained upon the rim, or too loose in the center, cannot be successfully run—hence the importance of so hammering the saw as to effect equal strain in all its parts, and at the same time RUN TRUE. This department is under the personal supervision of myself, who has devoted over twenty years to the art of saw making.

I am sole proprietor and manufacturer of the celebrated "Challenge" Cross-Cut Saw. Price Lists of all kinds of saws sent on application.

JAMES OHLEN.



Price: Japanned No. 6, \$5; Coppered No. 6, \$6; Silvered No. 6, \$8.

Liberal discount to the trade. All springs warranted to be of the best Steel Wire.

Depots: HYATT & SPENCER, 54 Beekman St., N. Y. SIDNEY SHEPARD CO., 68 Main St., Buffalo, N. Y. PALMER & GRAY, 225 Elm St., Cincinnati, Ohio. Factory, Indianapolis, Ind.

GEORGE GUEUTAL,
 39 West 4th St., New York.



Wood Screws, Steel in Sheets,

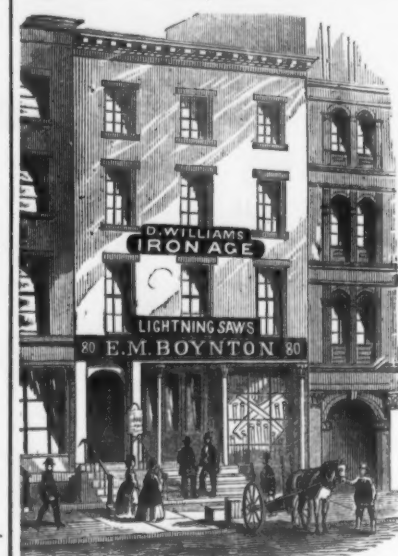
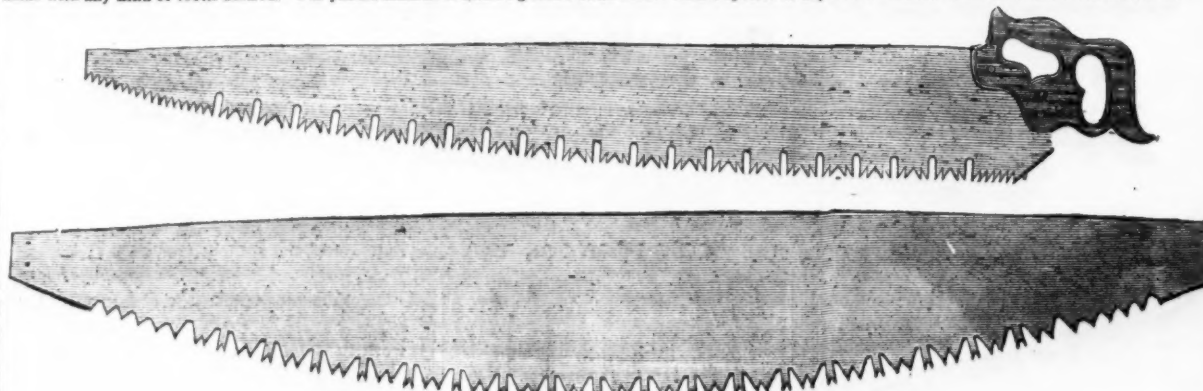
BAND SAWS, TOOLS FOR BRAZING, &c.

Bed Screws, Pin Hinges, and Wire Nails a Specialty.

J. FLINT & CO.,

Manufacturers of all kinds of SAWS and PLASTERING TROWELS, Rochester, N. Y.

A large Stock of Cross Cut Saws constantly on hand. Orders filled promptly. Dietrich's Double Handle One Man Cross Cut Saw made with any kind of tooth desired. Our patent method of grinding Hand Saws makes them superior to any in the market. Send for illustrated Price List.



BOYNTON'S LIGHTNING SAWS.

Awarded the Medal of the American Institute, 1872.



Two Direct Cutting Edges, instead of one Scraping Point. Note extra steel and durability over the old V, outlined on M tooth.

A Challenge of \$500, toward expense of a public test, to prove that the Lightning Saws excel all others in Speed, Ease, and Simplicity, has been offered since 1870, and has never been accepted. More than 100,000 Lightning Saws were sold during the year 1872, the purchases of which testify to their superior merits.

Our leading papers, such as the Tribune, American Agriculturist, Christian Union, etc., have published over sixty editorial notices recommending these Saws. Farmer's Clubs, Lumbermen, and Hardware Dealers unite in pronouncing the genuine Lightning Saw the greatest labor-saving implement of the age.

I have hundreds of letters from practical sawyers, voluntarily written, expressing their entire approval of these Saws. Where the Hardware Trade do not sell the Lightning Saw, I will send a 6-foot cross-cut and a buck saw-blade on receipt of \$5.

For Catalogue and additional information, address

E. M. BOYNTON, 80 Beekman St., New York,

Sole Proprietor and Manufacturer.

WM. McNIECE,
Excelsior Saw Works.

515 Cherry St., Philadelphia.

Manufacturer of

Extra Cast Steel Saws of every description,
 Pat. Screw Socket Pole Pruning Saws,
 Patent Screw Socket Edging Knives,
 Patent Screw Socket Scuffle Hoes, and
 Patent Screw Socket Paper Hang-
 ers' Scrapers,
 Mowing Machine Sections of all patterns
 constantly on hand.

WHEELER, MADDEN
&
CLEMSON,

Manufacturers of Warranted Cast Steel

SAWS

of every description,
 including

Circular, Shingle, Cross Cut,
 Mill, Hand, Roberts' and
 other Wood Saws,

&c., &c

Cast Steel Files

of the well known brand of

Wheeler, Madden & Clemson.

FACTORIES:

Middletown, Orange Co., N. Y.

BRANCH OFFICE:

97 Chambers Street, New York.

BRUNDAGE FORGED HORSE NAILS,

Manufactured from

BEST NORWAY IRON,

by BRUNDAGE & CO. Sold by

WHEELER, MADDEN & CLEMSON

Middletown, Orange Co., N. Y.



Cutlery.

Landers, Frary & Clark,

New Britain, Conn.,
MANUFACTURERS OF

TABLE CUTLERY

OF EVERY DESCRIPTION. ALSO,

General Hardware,

IN VERY GREAT VARIETY.

298 BROADWAY, N. Y.

HENRY DICKINSON,

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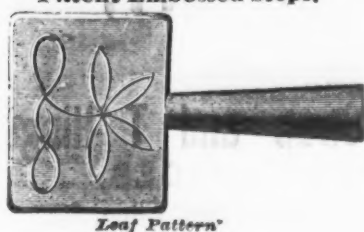
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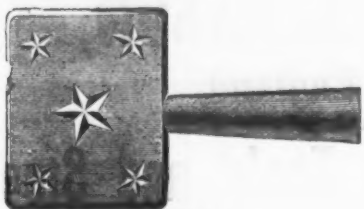
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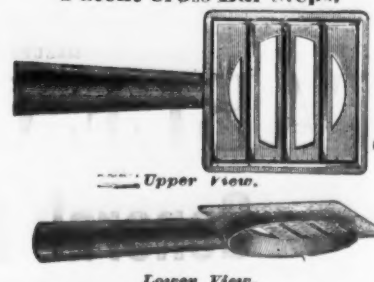
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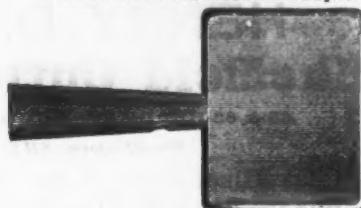


Patent Cross Bar Steps.



Lower View.

Solid Plain Pattern Steps.



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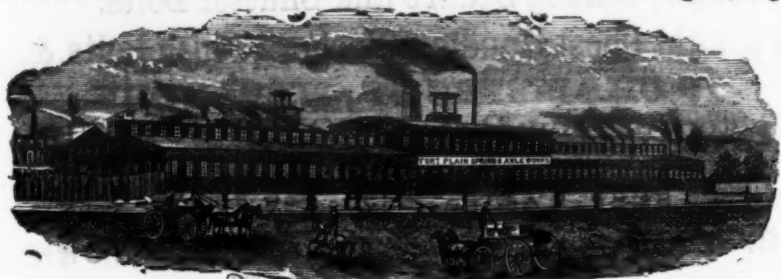
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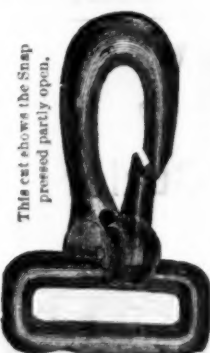
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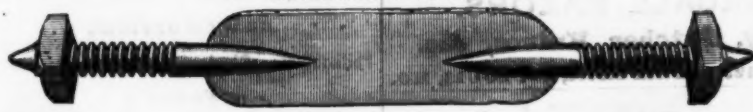
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Gage Cocks and Damper Regulators.	
Murphy & Keller, Baltimore, Md.	31
Galvanized Iron.	
Leffers Marshall Jr., 94 Beekman, N. Y.	4
Glass, Importers of.	
Downing A. C. & Co., 27 Beekman, N. Y.	23
Governors.	
Shive Governor Co., Bethlehem, Pa.	27
Grindstones.	
McDermott J. & Co., Cleveland, O.	23
Shepard Sidney & Co., Buffalo, N. Y.	6
Wood Walter R., 283 and 285 Front, N. Y.	23
Gunpowder, Makers of.	
Kneeland F. L. (Duport) 70 Wall, N. Y.	23
Lafin & Rand Powder Co., 21 Park Row, N. Y.	23
Hammers, etc., Manufacturers of.	
Emmet Hammer Co., Brooklyn, E. D., N. Y.	3
Hammock C. & Son, 13 N. 10th, Phila.	3
Minot & Co., Oliver, Boston.	15
Nelson Tool Works, 157 E. 3rd, N. Y.	8
Handles, Hoe, Rake, &c.	
Smith J. W. H. & Co., Charlotte, Mich.	26
Hardware, Brass and Galvanized.	2
Tiebout W. & J., 290 Pearl, N. Y.	2
Hardware, Cast-iron Merchants.	
Fernald & Stee, 100 Chambers, N. Y.	21
Green R. M., 100 Chambers, N. Y.	12
Pratt & Sons, 100 Chambers, N. Y.	12
Walbridge Geo. B., 25 Chambers, N. Y.	23
Hardware Dealers.	
Lloyd, Supple & Walton, 435 Market, Phila.	14
Louderback, Gilbert & Co., 53 Chambers, N. Y.	23
Shepard Sidney & Co., Buffalo, N. Y.	23
Turner, Seymour & Judd, 64 Duane, N. Y.	21
Hardware Importers.	
Beas & Murray, 54 Cliff, N. Y.	11
Baker Hermann & Co., 101 Duane, N. Y.	11
Field Alfred & Co., 47 John, N. Y.	11
Hilger & Sons, 77 Chambers, N. Y.	11
King H. & J. W., 30 Chambers, N. Y.	11
E. Frith, 16 Cliff, N. Y.	11
Louderback, Gilbert & Co., 53 Chambers, N. Y.	11
Van Wart & McCoy, 43 Chambers, N. Y.	11
Turner R. A., 31 Chambers, N. Y.	11
Hardware Manufacturers.	
Biddle Mfg. Co., 33 Chambers, N. Y.	24
Enterprise Mfg. Co., Phila.	24
Hart, Bilven & Mead Mfg. Co., 345 Pearl, N. Y.	24
Kellogg Wm. F. & Co., 100 Chambers, N. Y.	24
Lane, Gale & Co., Troy, N. Y.	21
Louderback, Gilbert & Co., 53 Chambers, N. Y.	24
Many F. L. & Manham, 100 Chambers, N. Y.	24
Middletown Tool Co., 53 Chambers, N. Y.	12
Miller's Falls Mfg. Co., 78 Beekman, N. Y.	15
Pratt & Sons, 100 Chambers, N. Y.	12
Providence Tool Co., 11 Warren, N. Y.	14
Russell & Ervin Mfg. Co., 45 Chambers, N. Y.	14
Schweizer Mfg. Co., 51 Beekman, N. Y.	11
Shattuck W. F. & Co., 18 Beekman, N. Y.	11
Stanley Works, 58 Beekman, N. Y.	11
Turner, Seymour & Judd, 64 Duane, N. Y.	21
Union Mfg. Co., 40 Chambers, N. Y.	7
Wilson Mfg. Co., 31 Chambers, N. Y.	23
Hardware Specimens.	
Biddle Mfg. Co., 33 Chambers, N. Y.	24
Hase John A., rear 115 Vanhorn, Phila.	12
Hendon David, Providence, R. I.	6
Louderback, Gilbert & Co., 53 Chambers, N. Y.	24
Semple, Birge & Co., St. Louis.	23
Shepard Sidney & Co., Buffalo, N. Y.	6
Hive Hammers, Makers of.	
Bradley Mfg. Co., Syracuse, N. Y.	30
Hemp Piston Packing.	
Candell John & Co., 121 Fairmount Ave., Phila.	24
Hoisting Engines, Makers of.	
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Todd & Raftery Machine Co., 10 Bards, N. Y.	27
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Nellis A. J. & Co., Pittsburgh, Pa.	32
Horse Nails, Makers of.	
Yasable Horse Nail Co., 33 Chambers, N. Y.	3
Brundage & Co., Middletown, N. Y.	10
Globe Nail Co., Boston, Mass.	3
Putnam S. S. & Co., Newport, Mass.	10
Horse Shoes, Makers of.	
Burden Iron Works, Troy, N. Y.	11
Hubs and Spokes, Mfrs. of.	
Clemon J., 3rd and Diamond, Phila.	12
Hydraulic Jacks.	
Dudgeon Richard, 24 Columbia, N. Y.	32
Insurance, Boiler.	
Hartford Steam Boiler and Inspection Co.	8
Iron Brokers.	
Boynton Geo. A., 70 Wall, N. Y.	4
Hazard & Jones, 212 Pearl, N. Y.	4
Pelle W. H., 72 Wall, N. Y.	4
Iron, Corrugated, Manufacturers of.	
Corrugated Metal Co., East Berlin, Conn.	4
Moseley Iron Bridge and Roof Co., 5 Dey, N. Y.	4
Iron, Charcoal, Warm or Cold Cast.	
Quincy John W. & Co., William, N. Y.	4
Iron Commission Merchants.	
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Hand Jas. C. & Co., 614 and 616 Market, Phila.	21
Hopewell Graham, 418 N. 1st, Phila.	5
Malin Bros., 233 Dock, Phila.	5
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Williamson James & Co., 49 Wall, N. Y.	4
Iron Dealers.	
Abert Brothers, 190 South, N. Y.	4
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Borden & Lovell, 20 and 71 West, N. Y.	4
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Mathews Chas. W., 133 Walnut, Phila.	4
McKard, Gott & Co., 100 Chambers, N. Y.	4
Petree & Mann, 238 and 239 South, N. Y.	4
Pittier John F., 338 Water, N. Y.	4
Pomroy W. B., 200 Pearl, N. Y.	4
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Richard D. W. & Co., 25 Magin, N. Y.	4
Smith Gam'l G. & Co., 342 Pearl, N. Y.	4
Warner A. B. & Sons, 28 and 29 West, N. Y.	4
Will Co., James & Co., 40 Wall, N. Y.	4
Whitney Alfred R., 58 Hudson, N. Y.	4
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Burden Iron Works, Troy, N. Y.	4
Cleveland Rolling Mill Co., Cleveland, O.	4
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Rollstone Machine Works, Pittsburgh, Mass.	12
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Watson Andrew, 57 Dickinson, Phila.	12
Whitehill, Smith & Co., Newburgh, N. Y.	12
Wood Thomas, 205 and 207 Water, N. Y.	12
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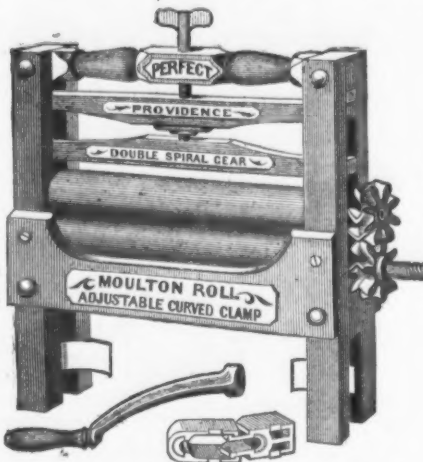
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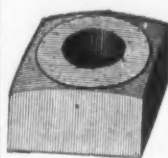
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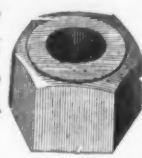
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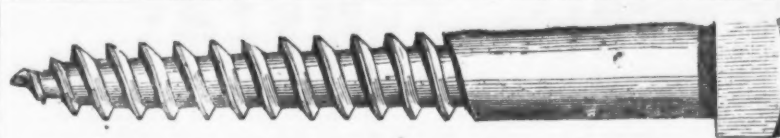
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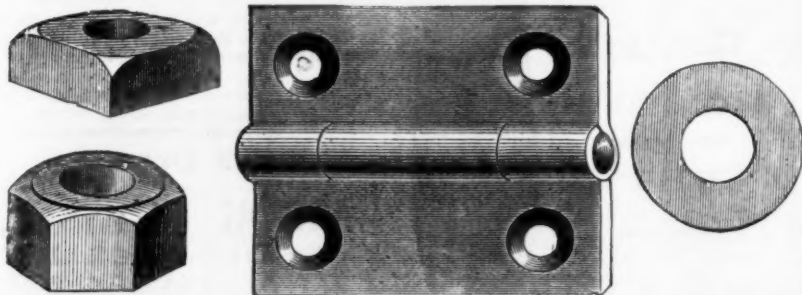
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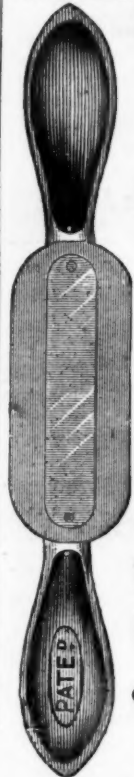
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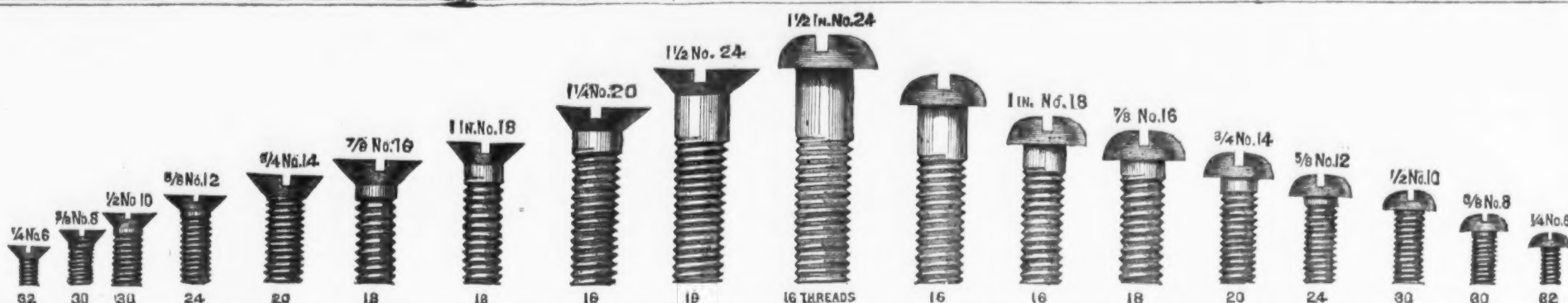
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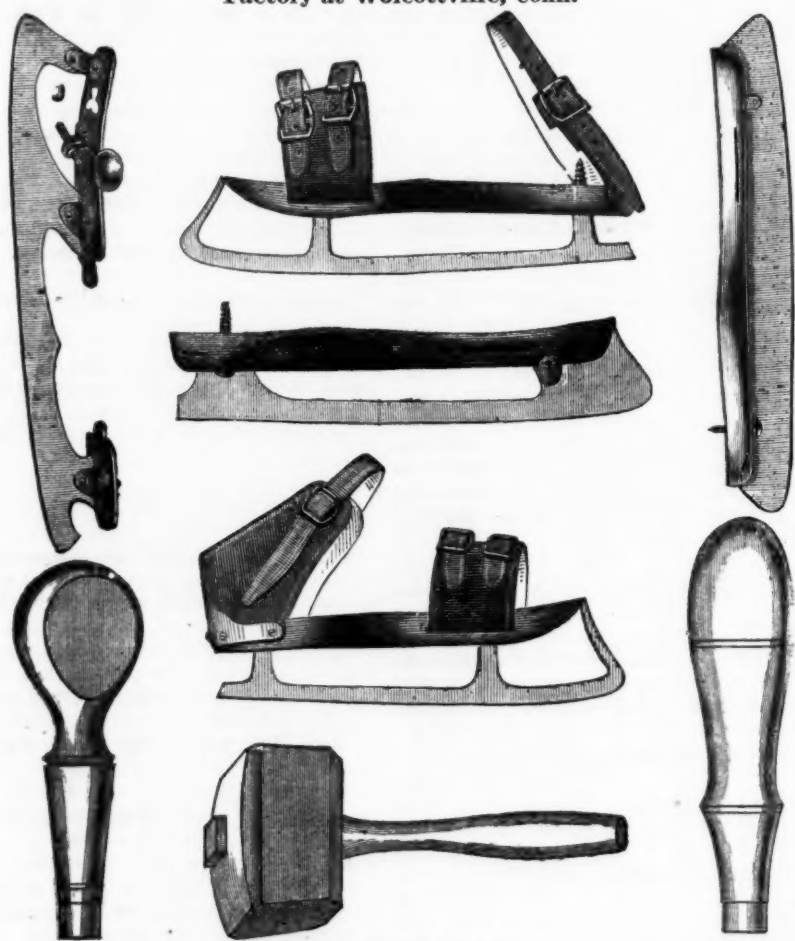
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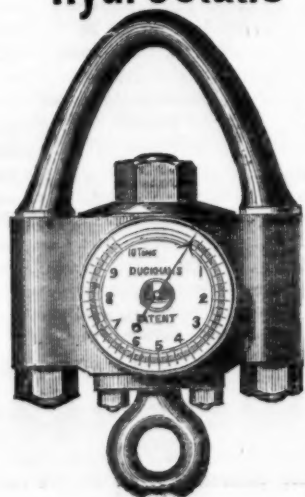
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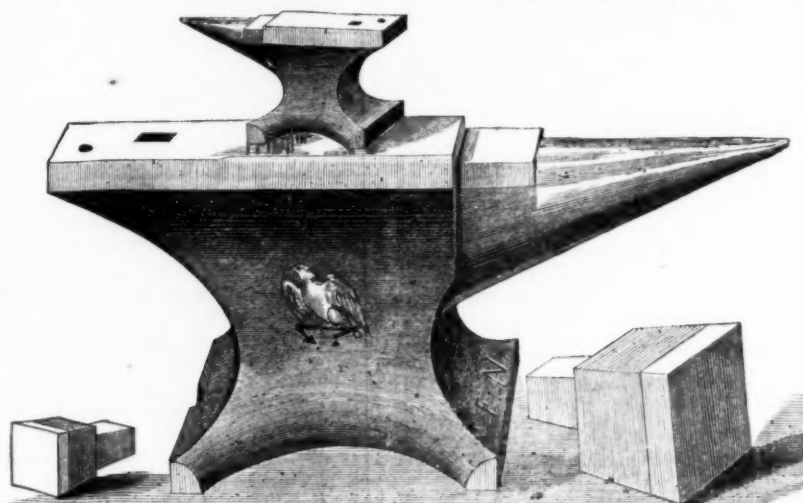
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New York, Thursday, December 18, 1873.

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Custom House Abuses which Demand Reform.

Our readers do not need to be told that we advocate the maintenance of a protective tariff of duties upon imports, and that we believe in the collection of such duties upon merchandise brought into the country by whatever means are best calculated to prevent smuggling. But we do not believe in a system which permits the authority delegated by law to customs collectors and Treasury officials to be employed as a means of blackmailing importers; and against any further toleration by Congress of the irresponsible exercise of this power we enter our earnest protest. We have also to protest against allowing certain laws to remain on our statute books, under cover of which our importers have been subjected to the grossest injustice.

The worst feature of our revenue laws is that they place an importer, whether guilty or innocent of intentional or unintentional violations of their provisions, wholly at the mercy of the government agents. If a charge is brought against him, his books may be seized and his business stopped for months, until it is convenient and agreeable to give him a hearing. If he is guilty of even an unintentional irregularity by

which the government has lost a dollar of revenue, owing to non-compliance with the letter of some ambiguous statute to which the Secretary of the Treasury has given a distorted interpretation, he may often be held liable in penalties to the amount of thousands. Of course, it is the importer's business to know both the law and its interpretation, and he should govern his actions accordingly. But even if guilty of no intentional or accidental violation of the law, which is rarely the case, he is, at most, permitted to resume business subject to such future interruption as the authorities may consider desirable. This is also an evil for which there is, perhaps, no remedy, save that of providing by law that a suspected importer shall be entitled to an immediate hearing before some court or commission, and before his books are seized and his business stopped; after that a prompt trial, if he cannot satisfactorily explain away, at the preliminary hearing, such charges as have been brought against him. It is the delay in such cases to which we object—a delay so costly to the importer in many cases that he will often bribe his persecutors to let him alone, though conscious of no violation of the law for which he could be held accountable in any court. We do not speak unadvisedly in saying that when a custom house officer suggests to an importer that an accommodation to the amount of two or three hundred dollars would be agreeable, and that it would be to the advantage of the importer to lend this amount without receipt or note, he can very often get what he wants. The delays of justice are more dreaded than the penalties of the law, and it is often cheaper to pay blackmail than to vindicate one's innocence. A system of laws under which such operations are possible is an outrage upon our civil rights and liberties. It places the importers in a position scarcely more enviable than that of the Jews in the days of the feudal system, when every baron who could get one within his castle walls considered himself privileged to put a price upon the Israelite's teeth, and to pull one out for every default of payment.

Another and grave abuse of official power has grown up, under authority of the law which permits suits against importers to be compromised by the payment of whatever amount may be agreed upon. By act of Congress approved on the 3d of March, 1867, it is provided that where a technical violation of the law may be assumed for which it would be grossly unjust to impose the full penalty, a less amount may be taken by way of compromise, but such compromise does not estop the government from further proceedings, as in the case of payment of fines and penalties in full. To secure such a compromise an importer must make confession of having violated the law, and this is often done to avoid suits which would cost so much in counsel's fees, loss of time, interruption of business and general annoyance, that the defendants cannot afford to let them go to the courts. As long as informer's fees are paid, and an amount left sufficient to divide among the official sharks and give each one something comfortable, there is no need to consider the rights of the importer on the one hand, or the interests of the Treasury on the other. We invite the friends of justice in Congress to make an earnest effort to have this whole business of compromising government suits thoroughly and impartially investigated.

A third necessary and desirable reform is the repeal of the law granting informers a percentage upon fines and penalties collected, and the enactment of a law in its stead imposing penalties for the offering or taking of bribes by importers and custom house officers, which shall make such crimes of rare occurrence. To discover violations of the revenue law is the business of the government servants. For this they are paid, and if their wages are not great enough, let them be paid more. If they cannot discover swindlers and smugglers, let them be dismissed and others appointed who can; but in no case should any one who wears the uniform of, or holds a commission from, the government have any share, direct or indirect, in the fines collected or penalties imposed. These belong to the Treasury, and under no system of participation in the profits of suits can importers be secured in the enjoyment of their right, under the common law, to be considered innocent of fraudulent practices until they are found to be guilty. This also demands careful and thorough investigation.

In calling upon Congress to reform these abuses, we are calling upon it to protect the interests of the Treasury as well as of the importers. A man who learns to be corrupt and dishonest in office, is as liable to sell his official power to the highest bidder as to use his power for blackmailing purposes. We could mention instances in which the Custom House authorities in this city have persistently refused to investigate charges of systematic undervaluation

brought against importers by committees of well known and responsible merchants in the same business, who were unable to sell goods properly entered in competition with those entered fraudulently. The only inference to be drawn from this is that the officials had been bribed. We have heard importers say, time and again, that intercourse with Custom House officials was calculated to speedily undermine the most firmly established commercial morality, and that a man was often tempted to save thousands by paying hundreds in bribes. All this is the natural outgrowth of the system which has grown up under existing laws, and the interest of the Treasury, as well as the protection of legitimate commerce, demands immediate reform. Our home industry gains no additional protection from these abuses, and they recoil upon the government which permits them to exist by diminishing its revenues.

Steam on the Canal—The "Baxter" and "City of New York."

It is to be regretted that certain journals claiming to be authorities on technical matters, and in their spheres of usefulness, great and small, exercising some measure of influence in shaping the opinions of their readers and the public, should venture to pronounce judgment upon the performances of this boat or that on the canal, without having any better warrant for their opinions than *ex parte* statements or newspaper letters and articles obviously written in the interest of parties competing for the reward of \$100,000 offered by the State. A notable instance of this is found in an article entitled "Success of Steam on the Canal," which appeared in the *American Artisan* of the 23d ult. "We are glad," says the *Artisan*, by way of introduction, "to chronicle the triumph, so far as all engineering difficulties are concerned, of the steam propulsion system on the canals. We say as far as engineering difficulty is concerned, because now come the usual difficulties in the way of all innovations, however useful. Old ideas, existing adverse interests, and—with sorrow be it spoken—perhaps a certain degree of envy and malice are the remaining obstacles. The trips last year, and again the present season, of the canal boat, Baxter, with which our readers are already acquainted, and her performance under the eye of the State Commissioners at the trial commencing on the 14th of October, ult., conclusive as they would seem, are now supplemented by the performances of a new boat, built and engineered upon the same principles, and by the same parties, but, in some respects, an improvement upon the Baxter, though of the same class."

The new boat referred to is the "City of New York," built by Mr. William Baxter, to correct some of the most serious defects of the boat which bears his name. After describing the construction of this boat and recounting its performances on the canal during the past season, the *Artisan* indulges in considerable general talk on the subject, which we take the liberty of thinking shows no greater knowledge of the conditions affecting the economical application of steam power to the movement of canal tonnage than might be gained from reading a pamphlet written with a view to popularizing the stock of the company owning the boats mentioned. Without suggesting a suspicion that the statements made in such a pamphlet would not be true to the letter, as regards the coal consumption, running time, freight tonnage and expenses of the "Baxter" and "City of New York," we think that no careful engineer would venture to express opinions regarding the success of these methods of applying steam to the canals without more information than such a pamphlet would be apt to give him.

The error of the *Artisan* is not so much in its figures, therefore, as in the conclusions it draws from them. The engineering difficulties in the way of moving boats on the canal—if any ever existed—were removed long ago; the commercial difficulties, by which we mean those in the way of making steamboats pay in competition with horse boats, have not been overcome, and we are further from a satisfactory solution of this part of the problem than we were in 1858, when the "S. B. Rugles" and "City of Buffalo" made regular trips carrying three-quarter cargoes aboard and full cargoes in tow. So far as Mr. Baxter's boats from meeting the requirements of canal traffic, that we do not believe any captain on the canal, owning a good horse boat, would trade it for the better of the two on condition of running it as a source of profit, and we think we are not going too far in expressing the belief that no experienced canal man would take either or both as a gift on such conditions. The reason for this is not found in the "envy and malice" with which the *Artisan* accredits the horse boatman, but simply because the steamer would not pay,

and could not be made to do so in competition upon equal terms with good horse boats. Now, let us examine, fairly and impartially, the actual facts of the case, so far as our space permits. We have as yet no official report upon which to base comparative calculations in the case of the City of New York, but taking Mr. Green's report of the performances of the Baxter last year, we find that, as compared with a first-class horse boat, she was not a success in any sense. Her compound condensing engines and twin propellers developed a total effective power of 44.4 horses. Deducting from this 16.2 horse-power expended on obliquities, friction of machinery, load, feed, air pumps and blower, we have a power for propulsion of 28.2 horses. Making a further reduction of 22.7 horse-power to produce the spiral slip of her propeller blades moving at 13.58 miles per hour, under the thrust which moved the boat, we have 5.5 horse-power remaining to be applied to actual propulsion. We thus find that only 12.4 per cent. of the primary power of her engines is applicable to the propulsion of the boat; also, that her net utility—equivalent to towage—equals only 2.8 horse-power, or but 6.3 per cent. of the primary power. In other words, the Baxter on her trial last year consumed a power of 44.4 horses to move her and her cargo of 200 tons 3.29 miles per hour, whereas 3.3 horses on the tow path would have towed her with the same cargo 3.29 miles per hour—equivalent to 2.8 horses, net. It is because of her very sharp lines that so small a quantity of power is required to tow her.

The "City of New York," built upon a plan somewhat different from the "Baxter," in using a single screw instead of the twin propellers for which so much was claimed, has done but little, if any, better than the "Baxter," so far as establishing a practical economy over horses is concerned. She was built in a superior manner of, superior materials, but strength and durability were sacrificed to lightness and speed. It is only fair, therefore, to compare her to a superior horse boat, which can make the round trip between Buffalo and New York in from 18 to 20 days, including the usual detentions at either end in taking on and discharging cargo. Taking the log of the trial trip of the City of New York as our authority, we find that she brought to New York on the 6th of November a cargo of 210 tons of wheat. Reducing this cargo from weight to quantity we find it to be 7000 bushels, which, at 13 cents per bushel, amounts to \$910, gross earnings. Deducting her reported running expenses, \$125.28, and tolls on the canal, \$217.35, we have \$567.37 as net earnings. A horse boat of 250 tons capacity would have earned upon her cargo \$1082.25, and would have made the trip in nine days, at a cost for running expenses of about \$118.50. Adding canal tolls, \$258.75, and deducting the total from the gross earnings, we have \$705 as net earnings, a gain of \$137.68 over the steamer.

In this calculation the steamer and horse boat are put upon the same footing, but the result does not by any means show the comparative economy of horse boats and steamers. The calculation must include not only running expenses for a certain number of days on the canal, but the whole expenses for the season, the whole number of trips made and tons of cargo carried, comparative durability, comparative cost for repairs, and the comparative cost of taking care of the two boats during the season of suspended canal navigation. Were all these items taken into account, it would be found that there is but little chance of running the steamer in profitable competition with the horse boats. Fifteen years ago a steam propeller came from Buffalo to New York in six days and fourteen hours, carrying three-fourths of a full cargo and towing the barge Shawnee fully laden. Allowing her twenty-four or thirty-six hours more, she could have taken the City of New York in tow also; and yet, after fair trial, she was withdrawn from canal service as a failure. Since that time our progress has been backward, and the results of Mr. Baxter's experiments have, we think, done nothing to establish an economy for steam over horses, without which steam cannot compete for the movement of the canal tonnage. We certainly wish that gentleman every success in his efforts to solve the vexed problem of steam canal transportation, but until he has solved it we respectfully protest against any official or unofficial recognition of such claim to the State bounty as he may now put forward. Our own opinion is that no steamer can be built which, carrying only its own cargo, can compete with horse boats, and that the only practical solution of the question will be found in the discovery of some system of applying steam to the towage, in train, of the class of boats now afloat; but if Mr. Baxter thinks differently, as it is evident he does, we shall watch his further experiments with the most friendly interest, if not with confidence in their ultimate success.

The Duty on Iron.

The *Detroit Free Press*, of recent date, takes occasion to preach a sermon against the tariff on foreign iron, and, in order to supply itself with a text, distorts a portion of the able report of Mr. James M. Swank, Secretary of the Iron and Steel Association, so as to make it convey to the reader a meaning very different from that intended by the writer. We quote as follows:

There is no demand for iron and until there is an active demand there necessarily cannot be a good market. The secretary intimates that this condition has been brought about by the action of Congress in reducing the duty on pig iron and manufactures of iron, and thinks that an increase of the duty by 40 per cent. would afford some relief. The facts in the case are very different from what the secretary asserts.

Now, in point of fact, Mr. Swank neither "asserts" nor "intimates" anything of the kind. What he does say is this:

With prices beaten down to the lowest possible cost of production, with many thousands of iron workers and miners out of employment, and thousands of others working at reduced wages; with idle furnaces and rolling mills and foundries in every iron district and manufacturing city of the country; with large stocks of unsold iron in almost every market, it is a proper time to consider whether it is wise longer to encourage the importation of foreign iron by continuing the reduction of duties which Congress has twice authorized during the past twelve months. This reduction, it has been abundantly proved, did not reduce the cost of iron to consumers, while the government lost the revenue on imported iron to the amount of the reduction. If the reduction is continued, encouragement is thus given to the foreign iron maker at a time when his American competitor is driven to the wall by a combination of adverse circumstances, not the least of which is the fact that, owing partly to this reduction, the foreign ironmaker has, within the past twelve months, sent to our shores many shiploads of iron which could have been as cheaply made in our own country. But for the heavy importations of foreign iron after the demand for American iron had commenced to slacken, there would be more general activity in the American iron trade to-day, and employers and employees would be in better heart. The aggregate value of our importations of iron and steel, and manufactures thereof, during the twelve months which ended on the 30th of June last, was fifty-and-a-half millions of dollars. We now see that these importations were not needed, and have done immense harm to the home iron trade and all dependent upon it. An increase of the duty on pig iron from \$6.30 to \$9 a ton, paid proportionally upon other classes of iron and steel, would be a wise measure of relief for Congress to enact immediately after it assembles. Better reduced revenue for the Treasury than cold and hunger in the homes of American workmen.

The question whether Mr. Swank is right or wrong in the position he has taken in the extract above quoted, resolves itself into the general question of whether protection to domestic industry is right or wrong in principle. If the *Free Press* thinks it is wrong, it is scarcely worth our while to discuss with it the wisdom or propriety of Mr. Swank's remarks. But in justice to that gentleman our contemporary should quote Mr. Swank in his own language, or not at all. That it refrained from doing so in the first instance, will surprise no one who may have taken the trouble to read the arguments it advances to disprove the evident absurdity which it pretends to have discovered in Mr. Swank's report.

Congress and the National Treasury.

The announcement of Mr. Secretary Richardson, in his annual report to Congress, that, owing to various causes, the Treasury deficiency for the current fiscal year would be about thirteen and a half millions, was not a matter of great surprise to anyone who has carefully studied the immediate and probable effects of the Treasury policy during the past year or two, and at the same time kept in mind the amounts which Congress considered it expedient to appropriate to the use of the several departments of the government. The amount of the reported deficiency exceeded the general expectations, but we cannot eat our cake and have it, too, nor can we spend or give away the public money to an amount exceeding the revenues of the government without making a Treasury deficiency to provide for. But that, in the present condition of affairs, Mr. Richardson should have considered it advisable to submit for the consideration of the Ways and Means Committee, a bill providing for an increase in the revenues to the amount of forty-two millions, or more than twice the estimated deficiency, is, to say the least, startling; and we are glad the Ways and Means Committee have not prescribed the unpalatable dose without pausing to consider whether there is anything so serious the matter with the Treasury as to require the application of such a dangerous and costly remedy.

No one who considers intelligently and carefully, the calculation upon which Mr. Richardson bases his recommendations, can resist the conclusion that he has considerably overestimated the probable deficiency. During the quarter comprising the period of a financial panic almost without parallel in our history, and which brought about the inevitable evils of commercial stagnation and industrial paralysis, there was a falling off in receipts of internal revenue at the rate of \$20,000,000 per annum, and to customs at the rate of \$35,000,000 per annum. But Mr. Richardson seems to forget that the panic is already over, and that with the beginning of what promises to be an unusually early and active spring trade, there will be a marked increase in the receipts of the government from internal revenue, and probably from customs.

Mr. Richardson, however, allows \$111,000,000 for customs receipts for the last

nine months of the fiscal year, from October to June, inclusive, which would show a falling off at the rate of \$40,000,000 as compared with last year, an estimate the correctness of which is certainly open to grave doubts. Again, he places the probable receipts from internal revenue for the last nine months of the fiscal year at \$66,000,000, thus making allowance for a falling off which would make the total receipts for this year from this source \$25,000,000 below that of last year. On customs and internal revenue combined his estimated reduction amounts to \$65,000,000 per annum, which is \$10,000,000 in excess of the falling off which has actually occurred during the three months of the year. Upon these startling calculations he estimates the deficiency for the nine months at \$13,530,000, and accordingly makes the modest demand for an increase in the amount of taxes to the amount of \$42,000,000 to cover it. What does he mean?

Without stopping to answer this question, which might be found as difficult and profitless as the riddle of the Sphinx, we will say that, in his estimates and his recommendations, Mr. Richardson has given fresh evidence of his eminent unfitness for the responsible office he holds. A finance minister who, after making the discovery that the commercial and financial disturbances of the past quarter have so seriously affected the general prosperity of the country as to cut off the government revenues \$65,000,000 and leave a deficiency of \$13,530,000, proposes the gentle remedy of saddling the people with \$42,000,000 of increased taxes, must consider that his sole duty as Secretary of the Treasury is to continue reducing the public debt at any cost, by redeeming the only obligations of the government for which it is neither necessary nor desirable to make premature provision.

That there will be a Treasury deficiency this year equal to about one-half the amount which Mr. Richardson estimates, is probable, and the Ways and Means Committee may, perhaps, consider it prudent, before the close of the session, to make some provision against possible contingencies; but we are glad to see that the committee are unanimous in the opinion that an increase of taxation is the last resort, and one not to be considered until the possibilities of economy are exhausted. It is useless now to inquire whether Congress has been too liberal in disbursing money already spent. Economy is never desirable for its own sake, but there are times when it is imperatively demanded, and upon such a time we have entered. The American people are liberal to a fault, and the experiences of the past ten years have shown that they carry patiently, if not cheerfully, the burden of a heavy taxation; but they will not now consent to have these burdens increased to the end that Congress may maintain a magnificent system of lavish expenditures and Mr. Richardson go on reducing the debt. Congress must learn the lesson which has already been learned by the people, and we consider it a hopeful sign of dawning reason that the prevailing sentiment in that body is against any increase in taxation which can be avoided.

Those who, through ignorance of the facts, are disposed to regard Canada as of small commercial importance, may be interested to know what official statistics show concerning her trade. The returns of Canadian commerce for the fiscal year ended with June, lately tabulated and published, show a total of exports to the amount of \$90,610,573, and of imports, \$126,587,523. This makes the foreign trade of Canada, as regards the value of imports and exports, \$218,197,096, an increase of \$26,848,317 over last year. We have already called attention to the value of our trade with that country in hardware and metal goods, and the opportunities offered for increasing it; and we incline to the opinion that if some of our manufacturers who are complaining of lack of orders would take advantage of this favorable opportunity to make a vigorous effort to introduce their goods into the out-of-the-way Canadian markets, where American shelf hardware has never been heard of, they would find the venture immediately and permanently profitable.

Scientific and Technical Notes.

In an able review of M. Gruner's valuable work entitled

STUDIES OF BLAST FURNACE PHENOMENA, Mr. Gordon, who has translated it into English, says: "The main point of novelty in the 'Studies,' and what gives them their chief interest, is the precision given to this doctrine, first distinctly taught by Mr. Bell, that the ratio of $\frac{CO_2}{CO}$ in the escaping gases is the index of the working of the furnaces. The determination of an analytic process of calculation in place of a synthetic is of value for direct investigation of any case of blast-furnace working that may present itself. Still, the only question

debated is the economy of fuel in furnaces, whether charged into the furnace and consumed there, or supplied from without as calorific in the heated blast. It is only when furnaces are working with the same, or nearly the same, charges of ore, flux, and fuel—i.e., same quality of raw materials—and yielding the same quality of iron, that we can get comparative results of a reliable nature. Furnaces may be working in one district as well as in another, although using very different quantities of ore and fuel, and yielding very different quantities of iron, and showing very different profit and loss accounts. Pig iron making, like other manufactures, must be looked at both from the purely technical and the economical point of view. There is a technical maximum of useful effect and an economical maximum of useful effect. The technical useful effect would be so much the greater as the yield of pig iron from a given weight of carbon and ores of the poorer qualities is greater, whereas the economical effect often involves other considerations, such as the maximum production of iron of a certain quality, regardless of the maximum technical effect. In most cases, the ironmaster is chiefly interested in the technical effect. There is, however, one feature of technical effect, viz., that of the superheated blast, which has for the last three years excited the liveliest controversy. The section 25 of the 'Studies' treats of this question on the basis of the experience recorded by Mr. Bell and others in the Transactions of the Iron and Steel Institute, and on the assumption that the combustible for heating the blast is the gases of the furnace itself. Mr. Gruner's examination of the question is, like that of Mr. Bell, full of instructive applications of the actual theory of the blast furnace. The complete technical answer awaits the result of experience of the cost of superheating the blast. To the question—whether there is advantage in heating the blast to 800 degs., 900 degs., or 1000 degs., the theoretical answer is undoubtedly, yes. For each rise in temperature of the blast there is increased economy, abstraction being made, of course, of the cost of maintaining and firing stoves for heating the blast. At the same time, this economy decreases rapidly with the rise in temperature. The economy arising from each accession of 100 degs. to temperature of blast is much less from 800 degs. upward than from 500 degs. to 700 degs., and still less than between 400 degs. and 500 degs., and thus in practice it is useless to exceed 700 degs. to 800 degs. Not having been able to collect sufficient data as to the cost of making and maintaining the stoves for superheating the blast, it is impossible for me to add to the weight of this opinion of M. Gruner, excepting to say that, after examination of all the facts hitherto published, superheated blast beyond the limits safely reached by the cast-iron stoves is useless; and if, as seems to be the case, it be thought necessary to erect generators of gas to heat brick stoves, that system is certainly wasteful, and a retrograde step in blast-furnace engineering.

The Engineer, in an article on the prospects of the North of England iron trade, describes as follows the

EFFORTS TO IMPROVE THE QUALITY OF CLEVELAND PIG IRON.

which are now making in that district: This movement is not before its time. Since the opening up of the rich mineral treasures of the Cleveland hills, many of the leading firms have been content with using the native ironstone without any admixture whatever. The iron resulting therefrom has uniformly been condemned for its inferiority, and "cheap and nasty" was the judgment universally pronounced upon the staple of the North. Cleveland iron was found to be unfitted for the manufacture of the better class of ship and boiler plates, while it was utterly impossible to convert it into steel. But cheap and bad goods are falling out of favor. Steel is every day coming into request for a thousand uses hitherto supplied by iron. It is found that the dearer commodity, so far as first cost is concerned, is in the end the more economical. Hence the metallurgists of Cleveland are taking steps to improve the quality of their various brands, and they are even striving for a place alongside the Bessemer ironmakers of the West coast. It is many years since Cumberland hematite was used in combination with the local ironstone, although not to any large extent. Up to 1862 the total quantity of Cumberland ore melted at Newcastle and Middlesbrough did not exceed 55,838 tons per annum, or about 9000 tons more than the quantity so melted in 1854, when the iron trade of Cumberland was in its swifling clothes. At no time since the commencement of the Cumberland iron trade has it been possible to purchase the finer ores of Cumberland, delivered in the Tyne or Tees, for less than 15/- per ton, or 10/- to 12/- more than the cost of the local stone. Ironmakers were, therefore, disinclined to purchase a little better quality of iron at the expense which a large consumption of Cumberland ore would necessarily have involved. Beside this, the West coast hematite was every day coming into greater demand at home. It found a ready market at its own door, and its value rose correspondingly to the pressure of the demand, until Cleveland ironmakers could not buy it delivered in the Tees for less than 25/- per ton. It was in these circumstances that attention was turned to the practicability of opening up the mineral resources of Spain, and a Commission was appointed by the Cleveland Ironmasters' Association to visit that country and report upon its prospects as a field of mining enterprise. The report of the Commission was most favorable. They found that abundant supplies of rich hematite, averaging fully 50 per cent. of metallic iron, could be worked at Bilbao for a trifling royalty payment; and here, therefore, several of the principal North of England firms, including Bolckow, Vaughan, and Co.,

and the Consett Iron Company, resolved to open up mines with the view of exporting the ore to the Cleveland district. The Bilbao mines were developed so rapidly that over 300,000 tons of Spanish hematite were delivered to works in the North of England during last year. Its cost at the works on Tees-side is at the present time, or rather was when the revolution stopped the trade, about 25/- per ton, or 17/- 6 per ton more than the present market value of the Cleveland ironstone. Whether the admixture of Spanish hematite confers advantages sufficiently sensible and material to make the importation commercially successful, we cannot say, but we may be allowed to point to the increased and still increasing value of Cleveland brands as a proof that this has been a step in the right direction. During a part of last year the pig iron of Cleveland stood higher in the market than Scotch warrants, although the latter is well known to be a much better and purer iron, more suitable for steel-making, and manufactured at a greater cost. Now that the import of hematite from Spain is rendered impossible by political events, the ironmasters of Cleveland are compelled to turn their attention to other sources of supply. It would be foolish to rely so far upon Spain as to be wholly or nearly dependent upon it for supplies of better class ores. At its very best, Spain is a broken reed, and other resources should be brought into requisition with all possible facility. A good deal of attention has lately been given to Lincolnshire and Northamptonshire, but the ores of these two counties are not so rich nor so pure as the hematite of Spain, and the freightage is so heavy as to make their importation unremunerative. A much superior quality of ore is found on Alston Moor, which is convenient both for the Newcastle and for Middlesbrough districts, and if the quantity is found to be large enough to make its working profitable, there seems to be here the germs of a very large and important trade. The Alston ore takes the technical shape of sparry or sparlike carbonates, or of hydrated peroxides, and it can be delivered at works on Tees-side for less than 21/- per ton. At present, however, it would be out of place to attach any great importance to resources so crude, inaccessible, and undeveloped. At any cost, and under any circumstances, the ironmakers of Cleveland are bound to exert themselves to improve the quality of their iron, otherwise they will stand a fair chance of falling behind in the race. A great test of all crude metal is coming to this—Will it make steel? If it does not answer this purpose its value must depreciate; and Cleveland iron, with its large percentage of phosphorus and sulphur, is admittedly unfit, in its present state, to stand that crucial test which commerce and civilization now impose. It must be the business of the Cleveland metallurgist, in the future that lies before him, to take all possible steps for the expulsion of the vitiating elements that now render his iron so unsuitable for steel-making purposes. Looking into that not distant future, we can discern, without prophetic inspiration, the application of steel for many purposes that it has not hitherto served. It is a matter of expediency, as well as of ultimate necessity, that the iron of Cleveland should be adapted for this purpose in one form or another. Phosphorus must be kept down. The 1 1/2 per cent. must be reduced to 0.02 before ordinary steel is obtained, and the 1.85 of silicon must be brought down to 0.01. Before this can be done hematites must be used in a much greater proportion than hitherto with the local ores of the Cleveland district.

A correspondent of the Colliery Guardian thus describes the

NEW PUDDLING FURNACES AT THE FONTNEYNYDD IRON WORKS.

near Pontypool, made under patents granted to Messrs. Riley & Henley: "The body or hearth of the furnace on which the materials are heated consists of a circular pan, with slanting sides. The revolving pan is fixed on a vertical spindle, and worked by bevil gearing by a very small engine, the number of revolutions of the pan being under the direct control of the puddler. The pan is so fitted that air cannot enter the furnace except at the working hole of the door. This puddling furnace is, with the exception of the revolving bottom and its connections, built up and stayed by plates and bolts like the ordinary puddling furnace, only that the back and front plates at the middle of the furnace are cut off about the bottom of the hearth to admit cool air under the pan. The tools used are nearly like those of the ordinary process, but the rabble has a projecting pin, which is caused to rest against the inside of the rabble-hole, in order to obtain a hold against the revolving mass of iron melted in the pan. The other principal tool used may be called a 'plough,' because it is something in the shape of a ploughshare and causes the metal to be turned over, broken up, and cleared after beginning to 'form' or 'drop into nature.' This tool, also, has a pin which holds it as in the previous case.

"Having generally described the new furnace, we will give a short account of its manipulation. The furnace having had a small dressing of hammer slag and ground bull-dog after the previous heat is set slowly revolving, and the puddler throws in his half pigs in regular course, so that they are equally distributed over the floor of the pan. The melting process then goes on as usual, but the revolving pan sucks the flame after it, and gives a more uniform and intense heat throughout the whole of the furnace, and, therefore, the melting is quicker. Before the melting is complete, the boy in attendance breaks up the unmelted pieces of pig iron, and mixes them as they pass the working hole, with the melted pigs, and in a few minutes the whole mass is in a beautiful state of fluidity, circling round in the pan, but traveling, from its density, at a slower pace than the bottom of the furnace, and consequently presenting fresh surfaces continuously to the flame. When melted, the puddler takes his rabble and fixes it in the hole in the door plate, and inserts it in the fluid metal, directing it from the circumference to the center of the pan, and vice versa; thus stirring the metal by the end of the tool, with little or no exertion on his part, or he turns it in the

opposite direction, and takes it up from the bottom as it rises. There is here none of the pushing and dragging which is the exhausting work of a puddler in the ordinary process. When the metal is coming to nature he removes the rabble, and puts in, and fixes as before, the 'plough,' which he presses to the bottom against the stream, causing the plastic material to roll over the tool in the form of a small cascade. The metal being 'fit,' the balling up is set about. The revolving pan is stopped; the iron in front of the door is formed into a ball, the furnace is then turned round one-sixth or so; another ball made, and so on, till the whole of the iron is balled up. There is no dragging about, and no poking in four corners, as in the usual process, but the puddler's work is brought to his hand by the action of the furnace. The lifting of the balls out of the furnace is also lightened in the same way, and, therefore, the men who are working these furnaces are very well pleased with them, as one would naturally expect. We understand that all the puddling furnaces at Fontneyndydd Works will be arranged on the patented plan."

PHILADELPHIA CORRESPONDENCE.

PHILADELPHIA, Dec. 15, 1873.

There has been very little of interest to note in this city during the week under review, save the steady improvement in trade and the general resumption of manufactures. The attention of the public is, and has been, concentrated in the new constitution, which is shortly to be submitted to the people for ratification or rejection. The opinions of men are about equally divided in regard to this matter, but probably the preponderance of capital is against it, and notably so in the case of corporations, which the provisions in the new code seriously restrict in their being and doing. The feeling has run high, and greatly to the injury of business. Next to this our manufacturing community, or that portion of it which thinks at all about matters of general interest, is exercised over the finance question. The propositions now before Congress scarcely touch the point in question, and, meanwhile, the necessities of the country continue without relief and the people in a state of suspense. Senator Ferry, in his late speech, put the matter in a practical manner before the country, when he said that over a million of men are out of employment in the country. "This million-handed loss is a loss of a million dollars daily; prolonged for a year the count swells to hundreds of millions and tells its fearful story." The senator need not wait for the fearful story a year, for, bad as the truth is, which he shows, he gives only a part of it. The value of the products of the labor of the million of men out of work, the price paid for their transportation by rail or water, handling, commission, insurance, interest, exchange, discount, and the whole total of business movements connected with such products, remain a dead letter while the million are idle. We are as surely losing what we do not earn and could earn as if it had been earned and not paid for, and the more so since in the latter case the product would have been in some one's hands, honestly or dishonestly, and represent such an addition to material wealth. Hence, the total of the hundred millions rapidly foots up. Senator Morrill proposes to return to specie payments and to decrease the volume of money, currency, or whatever may make the circulating medium. Henry Carey Baird, the well known publisher and no less well known sound political economist, shows the fallacy of Senator Morrill's theories in a vigorous letter to the *Enquirer*. Mr. Baird cites the condition of Great Britain as an evidence of the evil of the credit system brought about solely by an insufficient currency. There \$800,000,000 of circulating notes and coin is per force supplemented by credits in bills of exchange, etc., to an amount equal to \$5,300,000,000, with a consequent frequency of crises unknown elsewhere. In 1865 the bankruptcies in England were one in every 1500 inhabitants of population, narrowing this down to the business men who could incur debt, it is shown that one in every fifty persons who could use the credit system became bankrupt. Mr. Baird deprecates alike any contraction and free banking, and recommends an expansion of legal tender currency by the nation, having the feature of interchangeability (at the option of the holder) with government bonds bearing a fixed rate of interest; thus the country will naturally get back to a cash business and a currency always adequate to the demands of a cash system of trade, and not in excess of it, be furnished. Mr. Baird is one of the few of our sound and clear thinkers not in public life, who will devote business time to the benefit of the people. The pertinacity with which he hammers away at the evil of the hour, be it free trade, contracted currency, unfair legislation, or what not, is refreshing, especially as his opponents never seem to come back at him in the contest. In the above view of our monetary necessities his plan will strike the majority of business men, especially manufacturers, as the best proposed, but, unfortunately, that majority is not the majority of Congressmen, bankers or speculators, and hence we may not hope for anything so beneficial.

I noted in my last that the Philadelphia furnace of Messrs. Stephen Robbins & Son would be shortly blown in, and this was done during the week, marking an era for the iron trade of Philadelphia, and one which deserves to be noted. The furnace will now be making iron regularly, and December, 1873, should be marked as the period when one manufacturer, not having the fear of universal bankruptcy before his eyes, had the pluck to begin an industry which must, in a very few years, add millions of dollars to our material wealth.

A bill of importance to iron manufacturers, and especially to the stove trade, was introduced in the Senate this week by Mr. Sumner, which is entitled, "An Act to provide for the better security of property in patterns for metal castings." The bill forbids any person counterfeiting or making false similes of any metal casting by using such casting as a pattern, unless by written consent of the owner, under penalty of becoming liable to the owner for the original

ordinary wholesale profits upon the article so produced. This measure has long been needed, and many efforts have been made to get it before Congress. The stove trade has been the principal sufferer in this line, but all foundrymen will appreciate the benefits from it.

The telegraph announces the death of a well known and highly respected iron master of Pennsylvania, Isaac Eckert, of Reading, who died on the 13th inst., suddenly, of apoplexy. Mr. Eckert was, with his sons, the owner of the Henry Clay Furnaces, and one of the most influential citizens of Berks county. He had been president of the Farmer's Bank, of Reading, for twenty-five years, and of the Berks County Agricultural Society. He was a conservative, cautious man; a prominent republican politician, and especially well known as an iron master of great enterprise. A scheme is about ready to be offered in Congress, which our rail men will do well to justify their representatives on. It has a powerful lobby prepared, and will make a strong fight. This is "The New York and Chicago Air Line Railway and Telegraph Company." The bill supposes a double track all steel railroad, with branches to Cleveland, Toledo, Detroit, Cincinnati, St. Louis, and privilege to extend thence to Omaha. The capital is to be \$100,000,000, with right to purchase existing roads, to be relaid with steel rails; the whole to be begun within two years, and finished within six. The rate of fare is to be three cents per mile. The company offers for this franchise to carry the government mail and telegrams at rates to be fixed by the administration, provided permission be granted to import free of duty all the rails and other material necessary for the construction of the road. Under this neat little arrangement the rail mills and Bessemer works might shut down safely. Before this letter appears the corner stone of the bridge across the Hudson at Poughkeepsie will have been laid with all the honors. This will be another of our great engineering works, which P. nysylvania will have the honor of furnishing, the contract for the superstructure being held by the Keystone Bridge Company, of Pittsburgh. Thus the uses of iron for viaducts and highways, both steam and other, are daily extending.

The National Railway Company, formed to build the air-line road between here and New York, has had new life infused by the election of additional directors, mostly prominent rail-way men. One-fourth of the road is already graded, and the portion running from Round Brook, New Jersey, to the New Jersey Central could be put in running order very soon. The company owns the bridge over the Delaware at Yardleyville, and the piers for the bridge over the Raritan are already built. Most of the right of way is obtained, and under the general railroad law passed last year, the company can finish its road without fear of the injunctions which have previously obstructed it. The president is Joseph T. Crowell, of New Jersey, and Robert R. Corson, of this city, is secretary and treasurer. This insures us the speedy completion of a new first-class through road to your city. Great excitement has been felt in stock circles by the closing of a sale of 5000 acres of valuable coal land by the Lehigh Navigation Company to the New Jersey Central Railroad Company. This tract has five collieries and immense undeveloped deposits of the best coal. The Navigation Company sells none of its property in the Lehigh region, but this transaction was sufficient to make a little fever in the stock.

The new works of the Phoenix Iron Company, at Phoenixville, are progressing, and it is said proposals will be asked for the construction of a large reservoir to supply them with water. This reservoir is to be 400 feet long by 200 feet wide, and to hold 3,000,000 gallons of water. The Phoenix always does things on a grand scale, and thus commands success. A party of the officers of the American Steam Ship Company visited the Illinois, the latest new ship of the line, during the week, and thoroughly inspected her, with a satisfactory report. The Illinois will be under the command of Captain A. A. Fenger, late of the United States Revenue service steamer Hamilton. Considerable discussion arises regarding the price of ores for 1874. It is said the Champlain owners "let off" the mills which could not take last year's contracts in full on condition that they should contract for their supply for 1874 at the same price as 1873. This is making some squirming, as the price is considered too stiff for any rates of finished iron likely to rule in 1874, and as the production of each ton of bars requires the use of near 1000 lbs. of ore, at \$12 per ton in mill, it is rather costly. Now would be the time for the North Carolina magnetic ore men to show a little energy, and introduce their splendid settling ores, which the mill men of Eastern Pennsylvania have been anxious to get for several years. With 1873, it is said, the Cornwall ore owners will cease selling to outside furnaces and smelt their own ore entirely. This will make a demand for magnetic ores again, prices of which had materially depreciated. The individual who will "get away with" the bug bear of puddling will deserve from the iron trade as much lucre as Bessemer has taken. Preparations are making to introduce and thoroughly test the process of Dr. Ira M. Phelps, previously noticed, for decarbonizing iron while flowing from the furnace by burning out the carbon, &c. The great claim allowed in Dr. Phelps' patent is the repetition of the operation of "burning in suspension" during the process of decarbonization. As the same inventor has already demonstrated, upon precisely analogous principles, the possibility of desulphurizing gold and other ores, which process both the Franklin Institute and *Scientific American* consider "the greatest step of progress in metallurgy of the present day," it is presumable that in his new process he may give us a decarbonized iron without puddling, and so, assuredly a cheap and practical substitute for Bessemer and similar steels.

The following gives the quantity of coal shipped from Port Richmond for the year ending Nov. 30, 1873, furnished by Mr. Thos. M. Richards, shipping agent:

States.	Tons.
Nova Scotia.....	1,724
New Brunswick.....	7,773
Maine.....	100,093
New Hampshire.....	49,667
Massachusetts.....	997,836
Rhode Island.....	142,433
Vermont.....	850
Connecticut.....	74,891
New York.....	359,892
New Jersey.....	136,202
Pennsylvania.....	136,046
Delaware.....	8,069
Maryland.....	22,803
District of Columbia.....	101,387
Virginia.....	55,519
North Carolina.....	48,402
South Carolina.....	14,402
Georgia.....	10,717
Florida.....	7,836
Alabama.....	1,965
Louisiana.....	3,534
Texas.....	8,824
Cuba.....	7,613
South America.....	481
Sandwich Islands.....	732
California.....	1,805

Total..... 2,266,893

Of the above quantity there were sent:

To the New England States.....	1,393,313
New York.....	359,892
New Jersey.....	136,202
Pennsylvania.....	136,046
Eleven Southern States.....	365,069
California.....	1,805
Exported to foreign countries.....	18,269

merobadon, and an extensive deposit of lignite and black band, is found upon the surface. Further of there is plenty of coal, and if the Burmese should have patience enough to sink for it it could be brought down the river to the furnaces. In the expectation that this will be the case, quay arrangements have been made, but, if coal should not be got, the charcoal, of which there is an abundant supply, can be used for the purpose. The Burmese have adapted the Burmese description of fuel. The Burmese mill rolling plant comprises the bulk of the machinery which has been built here. Messrs. Claridge & North, of Bilston, are the firm who have produced it. It consists of puddling furnaces, steam hammers, forge trains, and spears, merchant train, and sheet mill. With the merchant train there have been sent a complete set of rolls for the production of rails for railway purposes, together with angles

iron of various sections, beside the several sections of ordinary merchant bars. Then a small guide mill has been added from the same foundry for the production of rounds and squares and rods. The staff of engineers and managers have already gone out. They will be under the direction of Mr. Robert H. Holgate, formerly chief engineer at one of the largest ironworks in South Staffordshire.

It would seem strange—yet there is apparently just the bare possibility of such a thing—if we were to find the Burmese competing with us for a part of that great trade with China and other eastern countries, which must surely, some day or other, arise. The Birmingham News, I may here say, has a paragraph relative to a new method, put forward by Mr. Gerhardt, of Cosely, and Mr. Cradick, of Bradley, for simplifying the process of making iron. The News does not state precisely what the new method is, but it states that "the president, the vice-president, the secretary, and the leading members of the Malleable Ironworkers' Association of Great Britain have visited South Staffordshire, to investigate a system of making iron at a much less cost of fuel, in particular, than hitherto; and in other respects with an economy hitherto deemed impracticable. The method was tested in their presence at works at Bradley, near Wolverhampton, which have been purchased for the carrying out of the system. The deputations were eight in number. They have a practical knowledge of the modes of working in all the English iron making districts; and after three "heats" of iron had been made, all under varying circumstances, they expressed their astonishment at the results and the simple manner in which they were obtained, and determined to take up the system, and start a company upon the limited liability system to work it. The thing is to be brought before the public, and especially the iron workers, under the immediate auspices of the association; the capital to be £50,000, in £5 shares. Yesterday a preliminary statement was being prepared, in which these leaders of the iron workers expressed it as their duty to seek practically to promote all and every means to lighten the labor of the iron worker, and at the same time to endeavor, by economy of production, to assist in counteracting the influences which are now at work to drive the iron drive away from England the making of iron. First and foremost of the subsisting restrictive evils was the enormous prices now demanded for fuel. Those prices were kept up by the vast quantities now used in the making of iron by the present method. The new system would immensely diminish the consumption of coal for iron making at the same time that it lessened labor, and, at moderate prices for the product, would, they believed, leave a very large profit. It is proposed to begin at first by making one iron of a superior quality at a saving, it is anticipated, of more than £400 per week upon a weekly output of 100 tons. The quality is to be nearly equal to charcoal iron, if the inventor keeps his word."

Information from Wales predicts a dull winter for the iron trade there unless a great influx of orders comes in. None of the works are busy saving the Landore Steel Works, which are doing very well in rails for America. Cyfarthfa and Aberdare send cargoes to Pysander last week, and they were the only ones of any weight. Rails are quoted £10 to £11; bars, £11 10/; hoops, £14 to £16; and refined metal, £7 to £8. We have at last reached the turn of that high tide which has lifted so many coal owners up to a pitch of prosperity never even dreamed of. They "took it at the flood," and it has led them on to fortune. The change, long delayed, but from the very beginning inevitable, is taking place. From one end of the Kingdom to the other prices of fuel are falling. In London the drop already amounted to 5/ per ton, and in the coal producing districts—such as this—quotations have gone down from 1/ per ton, for slack, to 3/ for house coal of certain descriptions. Increased production and a lessening demand were inexorable causes whereby this effect must be produced, yet, as I write, certain ignorant—they must be densely so—scribes are feebly endeavoring to show that there is no reduction. It is hardly worth while expending powder and shot upon these people, yet I make the allusion to show what littleness and meanness they will be guilty of when self-interest is awakened, or when a question of policy is involved.

The better state of the money market, which has become much easier during the week just ended, has given greater confidence to operators in metals, hence a fair amount of business has been done. Von Dadelzen & North's report says, as to copper: "We had a steady market during the early part of the week, and a fair amount of business done, at £83 10/ to £83 15/ per ton for good ordinary brands, cash, a few transactions being reported at £82 for early cash. The reduction in the bank rate, and the arrival of the Chilli telegram giving charters for second fortnight of October as only 1000 tons, induced considerable purchases at 20/ to 30/ advance, the closing prices being £83 10/ to £84 for good ordinary brands, Chilli, and £85 for picked brands. Of Australian, about 400 tons were done at £83 10/ cash, £83 10/ three months, for Wallaroo; and £82 10/ cash, £84 10/ three months, for Burra. English copper steady. Tin.—The market has been quiet. Small sales of Straits at £115, and Australian £114 to £115. The Dutch sale took place yesterday, and the whole 30,000 slabs were disposed of at an average of 67 1/2 c., £115, delivered in London. Since the sale only 500 slabs are reported sold. Smelters reduced their official price of metal £3, on Monday, and the standard of one also £3; present price of common ingots £119, and refined £121. Tin plates are decidedly firmer, with more demand from America, and makers are asking from 1/ to 2/ per box advance. Lead holds its position, at £24 2/6 to £24 5/1. Spelter: some business reported. Common brands of Silesian at £26 5/; special brand outputs at £26 15/ and 27/; London parcels nominally about £26 10/; Quicksilver quite nominal; £30 to £30 10/ per bottle. Yellow metal is quoted for export at 8 1/2 d.

London Metal Market.

(From The Mining Journal.)

	£	s.	d.	¢
Copper—W. ton.	83	10	0	0
Best Selected.	83	10	0	0
Tough Cake and Tiles.	83	10	0	0
Boils.	83	10	0	0
Best.	83	10	0	0
Old.	83	10	0	0
Burr Butts.	83	10	0	0
Wire.	83	10	0	0
Tubes.	83	10	0	0
Yellow Metal.	83	10	0	0
Sheets.	83	10	0	0
Spelter—W. ton.	27	10	0	0
Foreign on the spot.	27	10	0	0
To arrive.	27	10	0	0
Zinc—W. ton.	20	0	0	0
In Sheets.	20	0	0	0
Quicksilver—W. bottle.	30	0	0	0
Tin—W. ton.	119	0	0	0
English Blocks.	120	0	0	0
Ditto Bars (in bales).	122	0	0	0
Bacon.	117	0	0	0
Straits.	115	0	0	0
Tin Plates—W. ton.	1	16	0	0
IC Charcoal.	1	16	0	0
IX " " " " " "	1	14	0	0
IC " " " " " "	1	14	0	0
IC Coke.	1	8	0	0
IC " " " " " "	1	14	0	0
Canada Plates.	20	0	0	0

Iron—W. ton.	12	8	0	0
Bars Welsh, in London.	12	8	0	0
Nail Rods.	12	8	0	0
Nail Rods, Staff'd in London.	12	8	0	0
Bars.	12	8	0	0
Hoops.	14	8	0	0
Bars at Works.	14	8	0	0
Hoops ditto.	14	8	0	0
Sheets, single.	14	10	0	0
Fig. No. 1, in Wales.	5	0	0	0
Refined metal ditto.	7	0	0	0
Bars, common ditto.	11	0	0	0
Do, merchant, Type or Tee.	11	5	0	0
Ditto, Railway, in Wales.	10	0	0	0
Ditto, Swedish, in London.	19	2	6	0
To arrive.	30	0	0	0
Fig. No. 1, in Clyde.	5	5	0	0
Ditto, L.O.B., Type or Tee.	4	10	0	0
Ditto, Nos. 3, 4, L.O.B.	5	5	0	0
Spikes.	12	10	0	0
Indian Ch. coal Pigs in L'don	10	0	0	0
Steel—W. ton.	21	0	0	0
Swedish, in bales (rolled).	21	0	0	0
Ditto (hammered).	22	0	0	0
Ditto, in faggots.	22	0	0	0
English, spring.	24	0	0	0
Lead—W. ton.	34	0	0	0
English Pig, common.	34	0	0	0
Ditto, L.B.	34	0	0	0
Ditto, W.B.	34	0	0	0
Ditto, Sheet.	34	0	0	0
Ditto, Red.	34	0	0	0
Ditto, White.	34	0	0	0
Ditto, Patent Shot.	27	5	0	0
Spanish.	27	5	0	0

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Markland's Patent Saw Gummer & Sharpener.

Henry Disston says: "I consider Markland's Patent Saw Gummer the best thing of the kind in the market."

Merrick & Sons: "It gives us complete satisfaction and accomplishes all that is claimed for it."

E. Andrews, Saw Manufacturer: "I have been using another make, but considers yours decidedly the best."

Steinway & Sons, Piano Manufacturers: "Do not hesitate to recommend it as a first-class machine."

John L. Knowlton, Millwright and Machinist: "I have been using one of Markland's Machines for dressing saw teeth, and consider it the best machine in use for that purpose."

Address, **T. T. MARKLAND, JR., Cincinnati, Ohio.**

Wanted.

A partner with \$40,000 in a furnace situated on a railroad, close to a market, with various kinds of good ore, coal and limestone on the property. Iron can be produced at from \$16 to \$18 a ton. Between 4000 and 5000 tons of ore already mined. Twenty per cent. on investment guaranteed. Everything new, built in the best manner and embodying the latest improvements. Expenses of investigation defrayed by advertiser. Particulars can be obtained by addressing,

L. SINSHEIMER, 226 Alice Anna Street, Baltimore, Md.

TO MANUFACTURERS OF STAPLE AND HEAVY HARDWARE.

The undersigned having a flourishing trade in Northern Iowa, established 18 years, and now about to occupy one of the largest and most convenient stores west of the Mississippi, built expressly for his use, solicits agents or liberal terms of sale from manufacturers desiring to be represented in this market. Correspondence with **NAIL AND GAS PIPE** manufacturers especially desired. **W. C. CHAMBERLAIN, Jobber of Agricultural Implements and Hardware Dubuque, Iowa, Dec. 11, 1873.**

A Competent Hardware Salesman

With an established Western trade, may hear of a situation in a Philadelphia house, by addressing,

A. Y. C., Office of The Iron Age, No. 10 Warren St., N. Y.

DAYTON & LAMBERSON'S

(Copyrighted Revised List.)

DISCOUNT BOLT LIST.

Book form, Common and Philadelphia Lists, 20 discounts.

On Card Board or Paper, 15 discounts.

Single copy, \$1.00; two or more, 75 cents each.

Mailed, in perfect order, prepaid on receipt of price. Address **FRANK DAYTON, 83 Duane St., N. Y.**

GENTS: We take pleasure in saying that your Discount Sheets of Bolts and Screws are a first-class labor saving arrangement, answering for all the changes in discounts made by manufacturers. Convenient at all times for retailing and wholesaling.

BREARLY & Co., Trenton, N. Y.

MANAGER WANTED.

Wanted a competent person to manage the chipping, coaling and working of a charcoal furnace. One accustomed to working specular and magnetic ores preferred. References required. Address,

GEO. B. LOBDELL, Prest. C. F. I. & S. Co., Wilmington, Del.

MANUFACTURERS

desires of introducing their goods to the British and Continental Markets, are advised to insert advertisements in the newspaper "IRON," published every Saturday, at 99 Cannon Street, London, E. C.

SCALE: First 5 lines, 3/; every additional line, 10d. Price, 6d. per Copy, or 30/ per annum, inclusive of postage to the United States.

CHARCOAL IRON.

Parties owning a large and very superior Furnace, 90 miles from Cincinnati, and an unlimited supply of the best Iron Ore, adjoining it, with abundance of timber for making Charcoal, wish to enter into arrangements with men of experience and means to run the Furnace for a term of years, under arrangements to be agreed upon. There is no place in the United States where Charcoal Iron can be made at as low a cost, or where transportation to market will cost less. Apply to

JOHN A. POMEROY, No. 47 West Second St., Cincinnati, O.

R. T. HAZELL, AUCTIONEER.

By R. T. Hazell & Co.,

Store No. 118 Chambers Street.

Our REGULAR SALES OF HARDWARE, CUT LERY, FANCY GOODS, &c., will be held on TUESDAYS AND FRIDAYS throughout the season.

CASH ADVANCES made on CONSIGNMENTS without additional charge.

Special Notices.

Wanted,

A young or middle aged active and energetic partner, with twenty to forty thousand dollars capital, in an old established and well paying wholesale business in a healthy Western city. Best of references given and required. Address, **B.,**

Office of The Iron Age, 10 Warren Street, N. Y.

A young man desires a situation as manager for a furnace company. Has eleven years experience in the business; best of references given. Would prefer to go West.

Address **"IRON," Allentown Lehigh Co., Pa.**

To Lease on Royalty.

A tract of eight hundred acres of Iron Lands, in Luzerne county, Pa. Five veins of ore aggregating fifteen feet thick. One vein of Manganese Ore, well adapted to the manufacture of steel.

Call on or address **JOSEPH SMITH, Stoddardsville, Luzerne Co., Pa.**

Or **M. R. Murphy, 441 Broadway, N. Y.**

"ENGINEERING,"

A Weekly Illustrated Journal, edited by **W. H. MAW and JAMES DREDGE.**

OFFICES, 87 Bedford St., Strand, London, W. C.

62 Broadway, New York.

GEO. ED. HARDING, C. E.

Representative in United States.

This most successful English Engineering Journal, containing thirty-six pages, weekly, illustrating the latest advances in Civil, Mechanical, Mining and Military Engineering Science, both in Europe and America, can now be obtained by American subscribers, post paid, for \$2.00, currency, per year, sent to the New York office of the Journal.

All the important details of the buildings and move machinery at the great Vienna Exposition will be illustrated and described in *Engineering* the current year; and this, with illustrations of all the larger American engineering structures, will render it invaluable to every American Engineer, Architect, Iron Master and Machinist.

The best medium for advertising American Machinery to the attention of European capitalists.

Send for specimen copy, free.

New York, July 1, 1873.

THE CANADIAN BANK OF COMMERCE.

Capital - - \$6,000,000, Gold.

Surplus - \$1,500,000, Gold.

The New York Agency, No. 50 Wall Street, buys and sells Sterling Exchange, makes Cable Transfers, grants Commercial Credits, and transacts other Banking Business.

J. G. HARPER, J. H. GOADBY, Agents.

STERLING

IRON & RAILWAY CO.

MAKERS OF

STERLING

ANTHRACITE PIG IRON

FOR FORGE AND FOUNDRY USE.

A. W. HUMPHREYS, Treas.,

42, PINE ST., N. Y.

Map of the Mineral Resources of

Chattanooga, Tennessee,

and Vicinity.

Compiled from surveys made with a special view of showing the location and boundaries of the three different kinds of Iron Ores and Coal Measures lying within a radius of about one hundred and twenty-five miles of Chattanooga. It also shows the different Railroads and Navigable Rivers and principal towns within this district, and routes to Washington, New York, Louisville, St. Louis, Cincinnati, Memphis, New Orleans, Mobile, and principal ports on the Atlantic Coast. This map is not published in the interests of any individuals nor landed proprietors, but with the view of showing to parties who may be interested in the manufacture of iron a section of country containing three different kinds of Iron Ores (which are shown in different colors), as well as coal in the greatest abundance, and their relative positions to each other. The map is gotten up by the publisher after an intimate knowledge of the country for twelve years, the last year of which he has employed two competent engineers in making special surveys, with a view of making it as nearly accurate as possible. It is about 27 inches by 36 inches in size, upon a scale of 15 miles to one inch, and printed on firm linen paper and put up in cases. It will be sold by subscription only, at the price of five dollars, and will be ready for delivery about the 15th of January next. Subscriptions can be made to the publisher, **S. B. LOWE, Chattanooga, Tennessee,** and to the **American Manufacturer, Pittsburgh, Pa.,** or to **H. B. NEWHALL, No. 11 Warren St., New York.**

For Sale, &c.

FOR SALE.

A first-class Hardware Store and Tin Store, located in one of the best towns in Ohio, doing a business of about \$65,000 per year. Stock will invoice about \$15,000. Satisfactory reasons given for selling.

Address, **N. & B.,**

Care Office of The Iron Age, 10 Warren St., N. Y.

Iron Foundry For Sale.

Any person wishing to engage in the foundry business, may learn an opportunity to purchase new building just erected for said business, all complete and ready to be started without delay or additional expense. A shovel factory adjoining the foundry will furnish a large and regular demand for castings. For further particulars, address,

H. F. A., Box 488, Northampton, Mass.

Or said property would be exchanged for unencumbered productive real estate.

For Sale, &c.

SECOND-HAND MACHINERY

For Sale.

We have now on hand and will sell at very moderate rates, the following lot of second-hand machinery, viz: Five Double Horizontal Engines, suitable for mining, tunneling or other purposes. Each of these engines has two cylinders, 7 1/2 in. diam. by 18 in. stroke; two drums, 4 ft. diam. by 4 ft. long; geared to engine in proportion of 8 to 1, and are provided with disconnecting gear and friction brakes.

One 8 Horse-Power Portable Lane & Bodley Engine. Cylinder, 6 in. by 12 in., nearly new.

One 25 Horse-Power Portable Engine, in first rate condition. Cylinder, 10 in. diam. by 24 in. stroke.

One 30 Horse-Power Portable Engine, with Circular Saw Mill and Saw complete.

One 15 Horse-Power Stationary Engine. Cylinder, 8 in. by 12 in.

Five 4 Horse-Power Locomotive Engines. Cylinder, 4 in. by 10 in.

One 30 Horse-Power Locomotive Boiler, in first-rate condition, nearly new.

One 25 Horse-Power Locomotive Boiler, in first-rate condition, nearly new.

One 30 Horse-Power Vertical Boiler.

One 20 Horse-Power Vertical Boiler.

"Two Fine Boilers, 26 ft. long, 42 in. diam., each with two 14 in. flues, in good order.

Four No. 3 Sturtevant Blowers.

Two No. 4 McKendree Blowers.

One No. 4 Turbine Centrifugal Pump.

Seven No. 6 Cameron Pumps.

One Earle Pump.

Three Woodward Pumps.

For further particulars, address,

WM. E. TANNER & CO., Richmond, Va.

For Sale,

With or Without the Real Estate,

The Orange County Foundry and

Machine Shop,

MIDDLETOWN, N. Y.,

Established 1842.

The most desirable property on the line of the Erie and Midland Railways. Has a large and valuable assortment of Patterns. Extensive and increasing trade, and affords parties wishing to enter the Iron Business an unusual opportunity. Satisfactory reasons given for selling.

Parties desiring to purchase are requested to call and examine, or address the undersigned,

E. P. WHEELER, Middletown, N. Y.

Valuable Iron Works,

For Sale.

The undersigned offers for sale the Iron Works in Pottsville, Schuylkill County, Pa., known as "The Washington Works," consisting of a

Large Stone Machine Shop & Foundry,

Brick Pattern House, Erecting Shop,

Stone Blacksmith Shop, Brick Office, and

Lot of Ground containing in front 195 feet 3 inches, and in depth 260 feet.

There will be sold with the above a large and valuable collection of Patterns, Heavy Crane Flasks and Heavy Core Spindles for making heavy Castings and Pipes of all sizes; Turning and Planing Tools.

The Works can be put in immediate operation. A favorable opportunity is here presented for enterprising men. The demand for Castings and Machinery is constantly increasing in this region. The property will be sold on liberal terms. If not sold in a reasonable time it will be for Rent.

For particulars apply to

J. W. ROSEBERRY, Trustee, Pottsville, Pa.

FOR SALE.

Hardware, Stoves & Tinware & Business House,

THE NICHOLSON FILE.

All Nicholson Files are cut with the Patent Increment Cut, an invention owned and controlled exclusively by us, the file cut in this manner being Patented as a new article of manufacture, and differs from all other machine cut files (all of which have their teeth cut with equal spaces) by being cut with teeth slightly expanding or increasing in size and space from the point, thus avoiding the too great regularity of teeth common to all other machine cut files. The tendency of all cutting tools with teeth or cutters placed at regular distances from each other may be illustrated (to the machinist at least) by the fluted reamer—as it is well known that if a round reamer be made with (say 12) teeth whose spaces are equidistant, the hole reamed will not be round and smooth, but will approximate to a hexagon in shape. Whereas, if the same number of teeth be made of irregular distances, the hole reamed will be both round and smooth. The same is true of a file, hence the necessity of its having teeth at unequal distances, and to which we have applied the name of Increment Cut File, which possesses all the advantages of hand cut work, and the accuracy and uniformity of machine work. It is now upwards of seven years since this File was introduced to the public, and the demand has increased until our production is undoubtedly treble that of any File manufactory in the country.

We put all files under seven inches in boxes of either one-half or one dozen each. These boxes are neatly arranged, and open on the end, on which the kind is plainly marked with printed labels, acknowledged improvements on the old methods.

The "Increment File" is not an experiment, but an established fact, and already has acquired a legitimate demand for upwards of 500 dozen per day. We employ no regular Travelers, but our goods may now be found in the hands of the principal jobbers and dealers throughout the country.

Prices and terms will be forwarded on application to

NICHOLSON FILE COMPANY,
Providence, R. I.

CAUTION.

It has just come to our knowledge that certain parties in the West are engaged in buying up WORN OUT FILES of our manufacture, and, after immersing them in an acid bath, selling the same in packages which have a label of the same color and general appearance as ours, and falsely stating as follows:

NICHOLSON FILES,

Providence, R. I.

Increment Cut.

Made from Best English Steel. &c.

Our friends and the public are cautioned against this deception, which we consider one of a most injurious character, not only to ourselves, but to all dealers and consumers who desire the

"NICHOLSON" FILES

as we produce them, as files so



treated are comparatively valueless for use.

We have taken steps to have the parties thus engaged in deceiving the public, and trading upon our reputation, presented to the Courts for treatment, and will thank our friends having information bearing upon this subject to notify us, promptly, of any parties who have sold, or are offering for sale, "Nicholson" files doctored and labeled as above described.

Nicholson File Co.,

W. T. Nicholson, Agent.

Providence, R. I., Sept. 25th, 1873.

All packages of NICHOLSON FILES leaving our works bear a label on green paper like the one herewith attached.

1816. 1844. 1850. 1868.
H. F. F. H. F. F. & SON. P. A. F. P. A. F. & CO

PETER A. FRASSE & CO.,

95 Fulton Street, New York,
IMPORTERS OF

Stubs' Steel Wire, Files and Tools,
Grobet Swiss Files,

Extra Quality English Spring Steel Wire,

Nos. 1 to 34.

Steel Wire for Sewing Machine Needles and for other Purposes,
French Cold Rolled Sheet Steel,

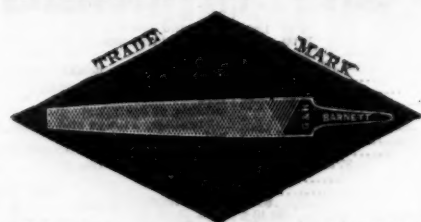
Sizes, 22 to 36 Gauge.

Jewelers', Engravers' & Mechanics' Tools.

The only Agents in the United States for

HUBERT'S CELEBRATED FRENCH EMERY PAPER.
For Hatters' and Machinists' Use.

Black Diamond File Works.

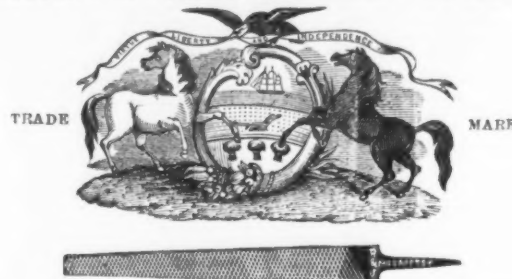


G. & H. BARNETT,

39 41 & 43 Richmond St. Phila.

HURD'S HURD'S HURD'S
RAZOR BLADE AXES
MANUFACTURED FROM THE
BEST ENGLISH EXTRA
CAST STEEL
BY THE
JOHNSONVILLE
AXE MFG.
CO.
AXES TOOLS
LANE, GALE & CO.
TROY, N.Y.

PENNSYLVANIA FILE WORKS.



McCAFFREY & BROTHER,
Manufacturers of FIRST QUALITY FILES and RASPS ONLY,
Nos. 1732 & 1734 North Fourth Street, Philadelphia, Pa.

G. W. Bradley's Edge Tools.

Butchers' Cleavers, Axes and Hatchets,
Bush Hooks, all patterns, Grub, Garden & Planters' Hoes,
Turpentine Tools, all kinds, Mill Picks, Mattocks & Picks,
Coopers' Tools, a specialty, Box Scrapers & Chisels,
Ship Carpenters' Tools, Cotton Hooks & Samplers.
N. WEED. 37 Chambers St.

FERNALD & SISE,

100 Chambers Street, NEW YORK,

HARDWARE MANUFACTURERS' AGENTS,

REPRESENT:
Reading Hardware Co. Barnes & Deltz. Underhill Edge Tool Co.
Crooke & Co. Nashua Lock Co. Plumb, Burdick & Barnard.
Verkes & Plumb. Arcade File Works. Hotchkiss, Tuttle & Co.
Hartje, Wiley & Co. William McNiece. Klein, Logan & Co.
Vulcan Horse Nail Co. Langstroth & Crane. T. T. Rhodes.
Walsh & Bro. Keystone Manufacturing Co. Orleans Scythe Stone Co.
Moran & Sons. A. E. Young. Lakin Manufacturing Co.

TURNER, SEYMOUR & JUDDS.

MANUFACTURERS, IMPORTERS AND DEALERS IN

Hardware and Upholsterers' Brass Goods.

SOLE AGENTS FOR

L. L. Davis' Patent Levels, Stevens' Calipers and Dividers,
Page's Auxiliary Jaws.

Manufacturers of Judd's, Prindle's and Combination Patent Curtain Fixtures, Locks and Curly's Patent
Raisin Seeder, Patent Twine Boxes, Picture Nails and Hooks, Escutcheon Pins, Coat and Hat Hooks; also
Miscellaneous Iron and Brass Goods.

Small Brass and Iron Castings made to order.
64 Duane Street, NEW YORK.

JAMES C. HAND & CO.

COMMISSION MERCHANTS,

No. 614 & 616 Market Street,

PHILADELPHIA.

AGENTS FOR:

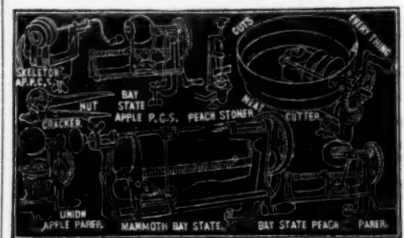
William Penn, Reading and Norristown Pig Iron.
Reading Iron Co.'s (Crescent Brand) Nails, Boiler Flues, &c.
Bar Iron, Plow Steel and Iron, South Easton Iron Wire.
Wm. Jessop & Sons' Steel and Norway Nail Rods.
Barrows, Savery & Co.'s Hollow Ware. Castings, &c.
Fisher & Norris' "Eagle" Anvils and Vises,
Washington Mills Emery.
Heavy Hardware, &c., &c.

W. F. SHATTUCK & CO.,

113 Chambers and 95 Reade Street, New York.

MANUFACTURERS OF AMERICAN HARDWARE.

Cross & Taft's Pat. Wrenches. Scale Beams. Wire Selves. Yaw's Cow Bells.
Age, Pick, Sledge & Hammer. Patent Tap Borers. Axes, Picks and Hatchets.
Hammers. Crow Bars.
Hatchets. Auger, Chisel & File. Climax Horse Collars. Boring Machines.
Mallets. Pat. Root Jacks. Brandage Horse Nails. Cast Iron Hatchets.
Gimlets and Gimlet Bits. Maguire's W. F. Iron Goods. Coffee Mills.
Augers and Auger Bits. Shattuck's Platform Counter. Star Steel Spoon.
Cocoa Nut Dippers. Scales. Stocks and Dies.



D. H. WHITEMORE'S
Meat Cutter.

Cuts Everything for the Family.

Works extremely easy. The smallest size will cut one pound of Sausage Meat per minute, two pounds of Pie Meat per minute, and Hash for a family meal in one half a minute. Price, \$30 per dozen. Hotel size (three times the capacity). Price, \$72 per dozen. Have been sold for one year. The highest premiums were awarded on each of the two sizes at the New England Fair, in Boston, in 1873. Packed Half Dozen in Case.

MANUFACTURED AND SOLD BY
D. H. WHITEMORE, Worcester, Mass.
ALSO SOLD BY
CLARK, WILSON & CO., 81 Beekman St., N. Y.

WILLIAMS WHITE & CHURCHILL,
SUCCESSORS TO
MACKRELL & RICHARDSON MFG. COMPANY,
Manufacturers of

Builders' Hardware,

Locks, Hinges, Hooks and Staples,
Awning Hooks, Meat Hooks, Pincers,
Champion Noiseless Pulleys,
CHAIN PULLEYS, &c.
Factory, cor. Flushing and Nostrand Avenues
BROOKLYN.
Warehouse, 73 Warren St., N. Y.

THOMAS TURNER & CO.'S
HORSE RASPS,
The best in use. All sizes on hand and for sale by
JOHN I. BROWER & SON
Hardware Merchants,
258 Greenwich St., N. Y.

Toy Pails, Covered.....dis 10 g
No.....1

[illegible]

WIRE—NET PRICES.	High Brass.	Low Brass.	Cop'r.
No. 26.....	0.41	0.45	0.51
No. 27.....	0.41	0.45	0.51
No. 28.....	0.41	0.45	0.51
No. 29.....	0.41	0.45	0.51
No. 30.....	0.41	0.45	0.51
No. 31.....	0.41	0.45	0.51
No. 32.....	0.41	0.45	0.51
No. 33.....	0.41	0.45	0.51
No. 34.....	0.41	0.45	0.51
No. 35.....	0.41	0.45	0.51
No. 36.....	0.41	0.45	0.51
No. 37.....	0.41	0.45	0.51
No. 38.....	0.41	0.45	0.51
No. 39.....	0.41	0.45	0.51
No. 40.....	0.41	0.45	0.51

Ten cents per pound extra for Spooling.

(Brown & Sharpe's Gauge.)

Plain to No. 30, inclusive.....\$0.54

No. 21, 22, 23, 24, advance on List for each No.

No. 24, 25, 26, 4c.

Above No. 30 special rates.

Plain Tube, 1-1/2 inch.....1.05

1-1/2 ".....1.05

All Mandrel-Drawn Tubes &c. advance on List.

Fancy Tubing 4c. advance on List above Plain.

English, Scotch, and Extra Patterns Fancy Tubing to

No. 30.....1.05

Tubing sawed or cut 2 to 4 ft. long, 2c. advance on

List.

Add to two cents a half-cent for each additional cut-

ting under two feet. 10% discount.

BRASS DOOR RAIL, Polished—54 cents per lb.—10%

Price per lb.....\$0.50

No. 34.....\$0.50

BRASS SILVER, 48 cents per pound discount 10%.

GERMAN SILVER MARKET METAL AND WIRE.

4 per cent. 12 inch, to No. 28.....\$0.90

10 ".....\$0.90

12 ".....\$0.90

14 ".....\$0.90

16 ".....\$0.90

18 ".....\$0.90

20 ".....\$0.90

Discount 10%.

German Silver Sheets over 12 inches wide and weighing

more than 10 lbs.....\$2.10

Advance two cents for each additional inch in width

above 12 inches and two cents per pound on each No.

thinner than No. 26 to 36, inclusive.

All German Silver thinner than No. 26 is Platers' at 50

cents per pound additional 10 per cent.

German Silver Scrap, one-third less than net price of 12

inch Market Metal; German Silver Turnings, Filings and

Chips, half the price of Scrap.

* Brown & Sharpe's Gauge is about two numbers finer

than Stubbs' Wire Gauge.

COPPER—DUTY: Pig Bar and Ingot, 5c.; old copper,

4 cents; Manufactured (including all articles of

which copper is a component of chief value) 45% ad

valorem. All subject to a reduction 10 per cent.

American Ingot.....\$0.35

English.....\$0.35

SHREATHING, BRAZIER COPPER, BOLTS, &c.

Braziers Copper, ordinary sizes, over 16 oz. per

square foot.....\$0.35

Braziers Copper, ordinary sizes, 16 oz. and over

12 oz. per square foot.....\$0.35

Braziers Copper, 12 oz. per square foot and lighter, 4c.

Circles less than 5 1/2 inch in diameter.....\$0.35

Circles, 5 1/2 inch diameter and over.....\$0.35

Segment and Pattern Sheets.....\$0.35

Locomotive Fire Box Sheets.....\$0.35

Sheeting Copper, over 12 oz. per sq. ft. and lighter.....\$0.35

Bolt Copper.....\$0.35

No. 10 Copper 12 inch x 14 1/2 inches, and not to

exceed 34 oz. to the square foot.

TINNING.

14x8, by the case.....\$0.35

14x8, less than case.....\$0.35

Boiler Sizes, 7 and 8 inch.....\$0.35

9 inch.....\$0.35

Other sizes not larger than 30x60.....\$0.35

Larger than 30x60.....\$0.35

Copper Bottoms.....\$0.35

O'NEILL'S PATENT.....\$0.35

14 and 16 oz. and heavier.....\$0.35

12 oz. and lighter.....\$0.35

7 in. 14x22, 8 in. 14x26, 9 in. 14x30

14 and 16 oz. and heavier.....\$0.35

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Paints, Oils, etc.

Paints.

Black, lamp—Coach Painters.....\$0.30c

Ordinary.....\$0.30c

Ivory Drop, fair.....\$0.30c

Black Paint, in oil.....\$0.30c

Blue, Prussian, fair to best.....\$0.30c

Chinese, dry.....\$0.30c

Ultamarine.....\$0.30c

Brown, Spanish.....\$0.30c

Van Dyke.....\$0.30c

Carmine, 40.....\$0.30c

Green, Chrome.....\$0.30c

Paris.....\$0.30c

Mineral Paints.....\$0.30c

Orange Mineral.....\$0.30c

Red Lead, American.....\$0.30c

Venetian (N. C.) dry.....\$0.30c

Indian, dry.....\$0.30c

Sienna American, Raw.....\$0.30c

Burnt.....\$0.30c

Raw.....\$0.30c

Umber, Burnt.....\$0.30c

Raw.....\$0.30c

Vermillion, Chinese.....\$0.30c

English.....\$0.30c

Trieste.....\$0.30c

American, Common.....\$0.30c

White Lead, American, pure dry.....\$0.30c

White, Paris, English, prime.....\$0.30c

Yellow Ochre French.....\$0.30c

Vermont.....\$0.30c

Chrome.....\$0.30c

Zinc White, American No. 1, dry.....\$0.30c

French (Paris).....\$0.30c

Oil.....\$0.30c

Linseed Raw.....\$0.30c

Boiled.....\$0.30c

Whale, Crude.....\$0.30c

Bleached Winter.....\$0.30c

Sperm, Crude.....\$0.30c

Winter unbleached.....\$0.30c

Bleached.....\$0.30c

Seal, Extra Refined.....\$0.30c

Lard, Pure Winter.....\$0.30c

Cotton Seed, Crude.....\$0.30c

Southern Yellow.....\$0.30c

White.....\$0.30c

Natural Lubricating.....\$0.30c

Asphaltum.....\$0.30c

Chalk.....\$0.30c

Dryer, Patent.....\$0.30c

Flocks.....\$0.30c

Glyce, White.....\$0.30c

Glacis' Points, Zinc.....\$0.30c

Gum, Copal.....\$0.30c

Damar.....\$0.30c

Shellac, English.....\$0.30c

Litharge.....\$0.30c

Pumice Stone, selected lumps.....\$0.30c

Putty in bladders.....\$0.30c

Rotton Stone, soft, English.....\$0.30c

Spirits Turpentine.....\$0.30c

Whiting, Spanish.....\$0.30c

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26 x 28 to 28 x 32.....\$0.30c

28 x 30 to 30 x 34.....\$0.30c

30 x 32 to 32 x 36.....\$0.30c

32 x 34 to 34 x 38.....\$0.30c

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52 x 54 to 54 x 58.....\$0.30c

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62 x 64 to 64 x 68.....\$0.30c

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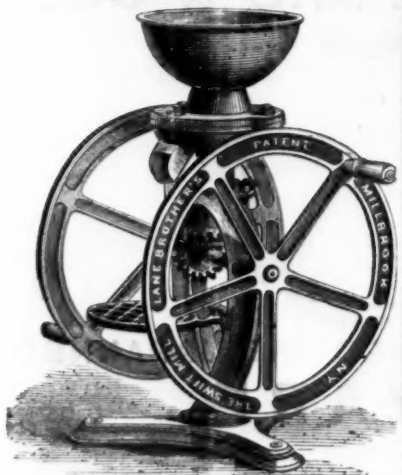
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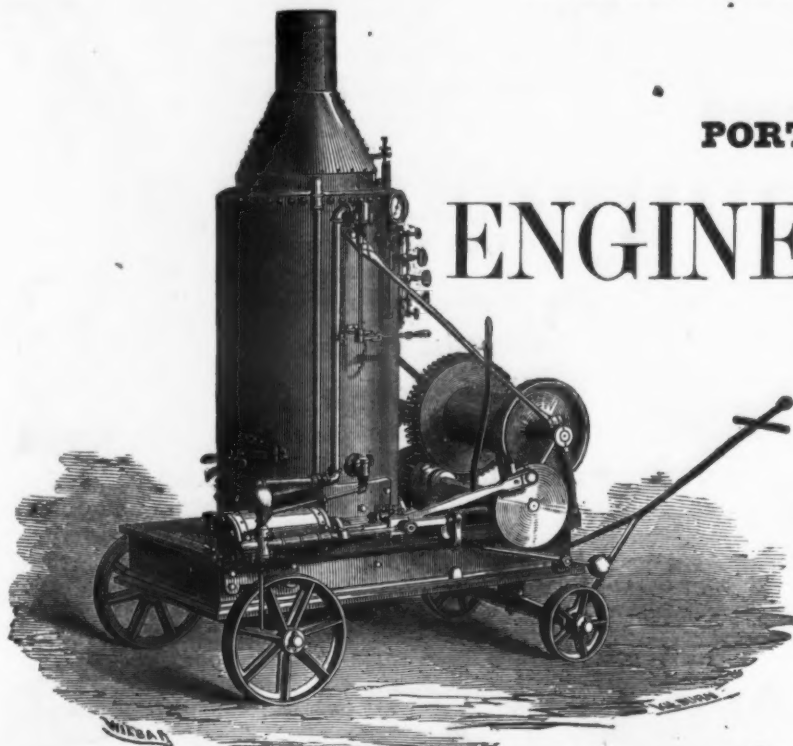
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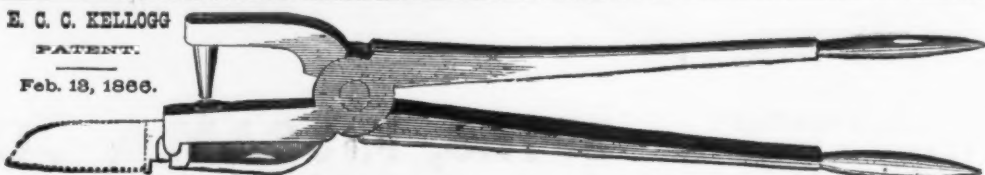
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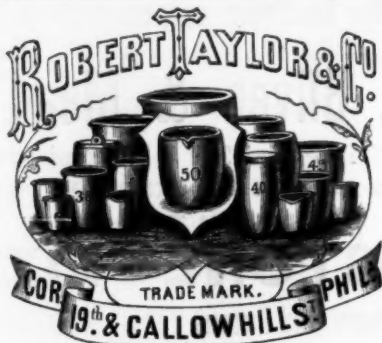
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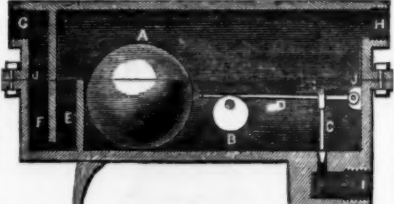
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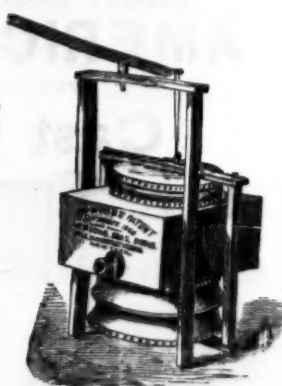
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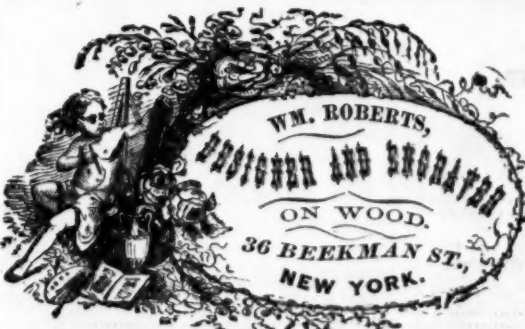
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Established 1838.
EVERY DESCRIPTION OF EN
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BOOK, CATALOGUE OR
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Machinery.

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CAST STEEL,

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All descriptions of Cast and German

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Minerva & Beaver Iron & Steel Works,

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MANUFACTURERS OF

"Jenks" Spring Steel, Cast and

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Also, Plow and other Iron.

VAN WART & MCCOY, Agents,

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A full assortment of "Jenks" Spring Steel in stock.

MILLER, BARR & PARKIN,

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Manufacturers of all descriptions of

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EQUAL TO ANY IN THE MARKET.

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Gunpowder.

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DUPONT'S

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DUPONT'S GUNPOWDER MILLS,

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Celebrated Eagle Ducking, Eagle Rifle

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LAFLIN & RAND POWDER CO.,

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IN EVERY PART OF THE UNITED STATES,

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Newburg, Saugerties, Kingston, and

Catskill, N. Y.; Scranton, Carbon-

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The superiority is well known of our brands

Rifle Powder:

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SAFETY-FUSE at wholesale.

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New Bedford, Mass.,

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Seythe—Dyer Edge Tool Co.	25 1/2
Hay and Manure Forks—Otisgo extra C. S.	25 1/2
Hoes and Garden Rakes—Jackson and Otisgo.	25 1/2
Seythe Stones.	25 1/2
Seythe and Bush Snathes.	25 1/2
Harvest Rakes and Barley Forks.	25 1/2
Revolving Horse Rakes.	25 1/2
Handles—Fork and Shovel.	25 1/2
Cradles—Nithington, Cooley & Co.	25 1/2
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Amoskeag Yankee.	13 00
Amoskeag Crescent.	14 00
Hunt's Yankee.	14 00
Kennebeck Yankee.	12 00
Lippincott.	13 00
" Crown.	14 00
" Bevel.	14 00
Jefford's Silver Steel.	14 00
Kennebeck, Reveled.	14 00
Amoskeag, Handled.	15 00
Boy's, Handled.	15 00
Boils.	
Carriage and Tire.	12 1/2
Cast Steel and Shutter.	20 1/2
Wright's Barrel.	10 1/2
" Square.	10 1/2
Butts.	
Cast Fast Joint, Narrow.	20 1/2
Cast Fast Joint, Broad.	20 1/2
" Long Joint.	20 1/2
" Pin, Reversible.	20 1/2
" Japanese.	20 1/2
" Silver Tip.	20 1/2
Wrought Narrow, Fast Joint.	20 1/2
" Broad.	20 1/2
" Loose Pin.	20 1/2
" Table.	20 1/2
Garretson's Blind Butts.	20 1/2
" Brick.	20 1/2
" Wood.	20 1/2
" Box sets.	20 1/2
Casters.	
Iron Plate.	25 1/2
Brass Wheel Plate.	25 1/2
Porcelain Wheel Plate.	25 1/2
Iron Wheel Plate.	25 1/2
Chisels.	
Butcher's Tanged Firmer.	25 1/2
Witherby Socket Firmer.	25 1/2
" Firmer.	25 1/2
" Firmer.	25 1/2
" Slicks.	25 1/2
Coffee Mills.	
Box 100 Iron.	3 1/2
Box 50 Cast Steel.	3 1/2
Side 50.	4 1/2
" 60.	4 1/2
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Cutlery.	
American Table.	25 1/2
Pocket.	25 1/2
Door Springs.	
Torry.	25 1/2
Rubber.	25 1/2
Boon's.	25 1/2
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No. 1 Axe.	25 1/2
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Hatchets.	
Amoskeag Shingling.	25 1/2
" Claw.	25 1/2
" Lath.	25 1/2
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Hinges.	
Strap and T.	25 1/2
Screw Hook and Strap.	25 1/2
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Machinery, &c.

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Office, - - - - - No. 223 State Street.

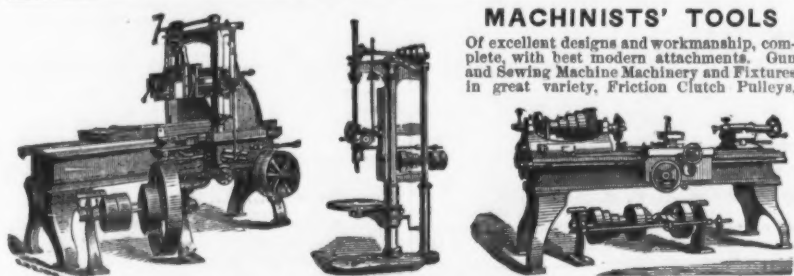
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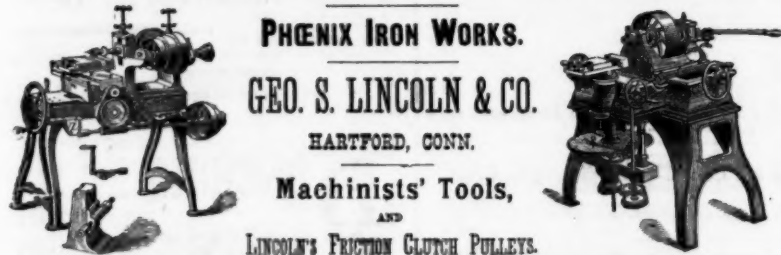
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POWER LOOMS, with (new) Patent Box Motion. SPOOLING, BEAMING, DYEING and
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Machines and Foundry Work in all their branches. Send for Price Lists, Pulleys, &c.**The "EMPIRE," a Fan Blowing
PORTABLE FORGE,**

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Without BELTS or BELLOWS.

It is more Easily Worked, gives a Better
Blow, and is the Cheapest forge made, and

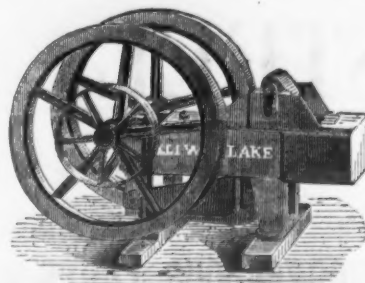
It has no Back Draught.

W. P. KELLOGG & Co., Troy, N. Y.

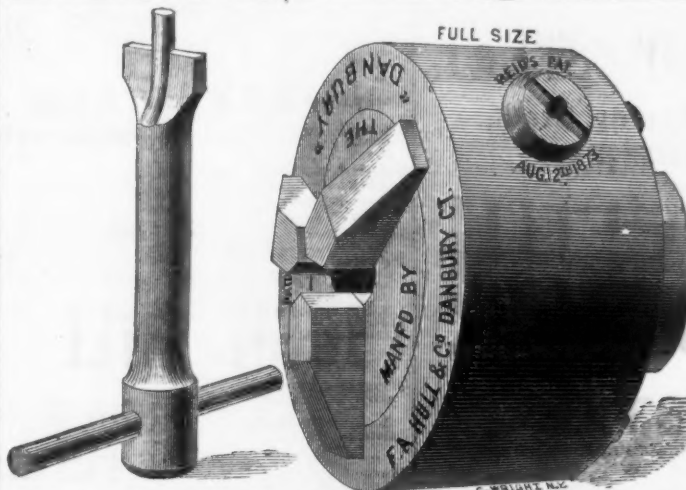
And 115 Chambers St., N. Y.

Also Carry Combs, Boring Machines,
and Coolie's Whip Racks, etc., &c.

Machinery, &c.

IMMENSE SAVING OF LABOR.**BLAKE'S****PATENT****CRUSHING MACHINE**

for reducing to fragments (of any required size) all kinds of

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Send for Illustrated Descriptive Circulars.

THE "DANBURY"

UNIVERSAL JAW

DRILL CHUCK,

C. H. Reid's Patent August 12, 1873.

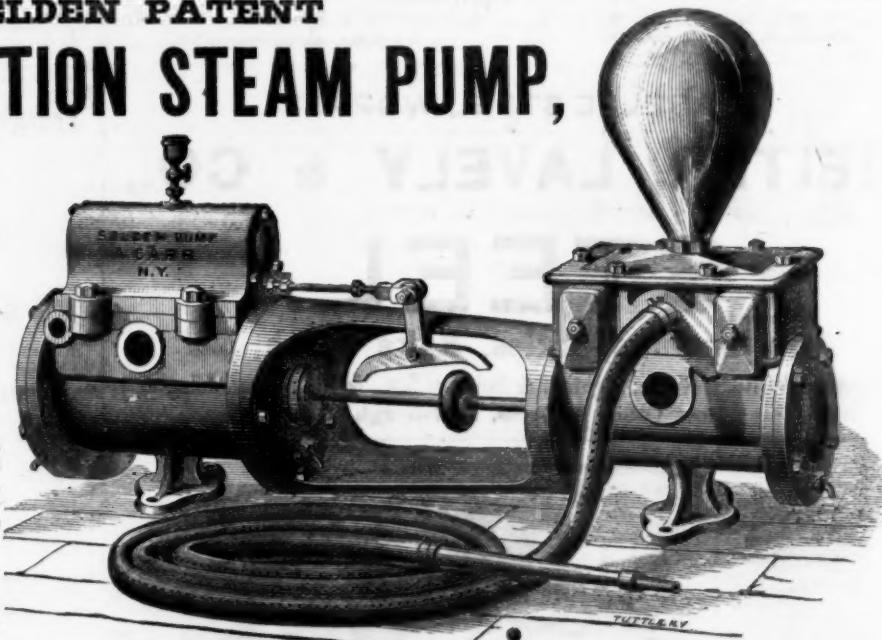
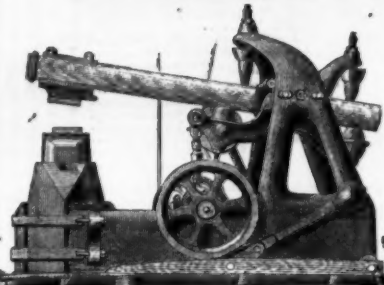
Most POWERFUL Chuck made. Holds drills from 0 to 5/8,
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Every Chuck is sold on full warrant, to be returned and cash
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Its "points of especial excellence" are Strength, Accuracy, Durability, Cheapness.

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Feed Attachment.For Boiler Feeders,
For Water Works,
For Fire Pumps,
For Mines, etc., etc.And for all purposes for which Steam
Pumps can be used. Sold under full
guarantee. Money will be returned if,
from any cause, they should prove unsat-
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List, fully describing them, to**A. CARR,**

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**BRADLEY'S CUSHIONED HAMMER.**This Hammer has many valuable improvements made useful in the device for cushioning the blow,
thereby relieving all the working parts from that jar and concussion which is the destroying element of
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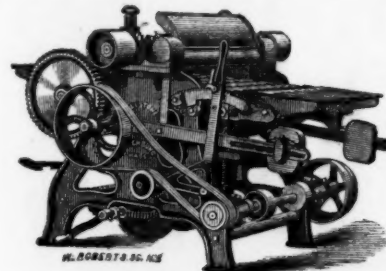
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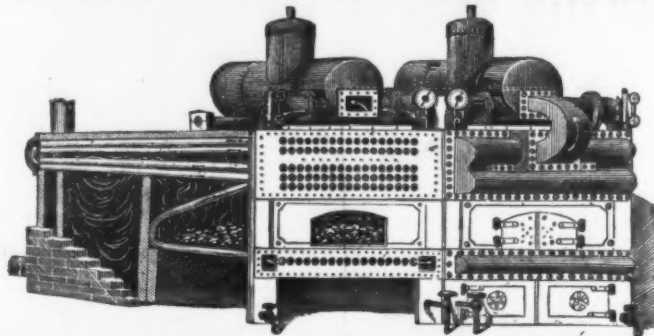
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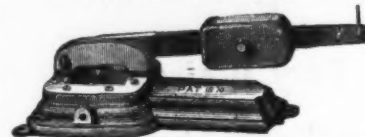
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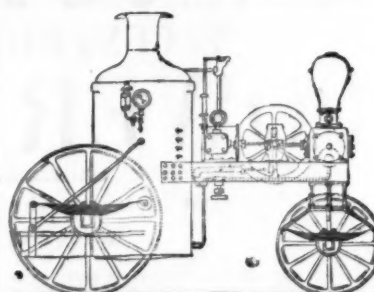
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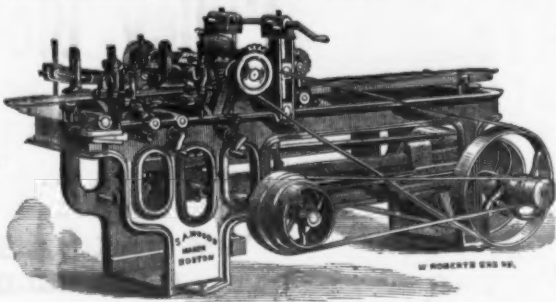
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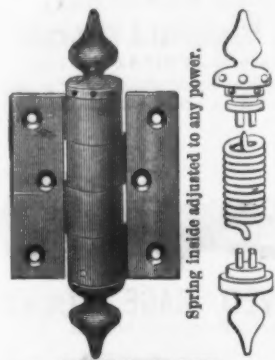
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